A MONOGRAPH OF THE GENUS MERTENSIA IN NORTH AMERICA[1]

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INTRODUCTION

The present study was made with at least two objects in view: to work on a problem which would yield results of a practical taxonomic value, and to straighten out one of the many puzzling genera concerned particularly with the flora of the Rocky Mountains and the West. *Mertensia* is a genus in which the entities have been much confused, particularly by the earlier authors on the flora of the West. Since the time of Gray's 'Synoptical Flora' numerous species have been described with too little attention given to the tremendous variation which may occur within a single colony in the field. Further, the genus is one which does not lend itself to a straightforward enumeration of characters by which entities may be differentiated. Characters, which may seem fairly definite in the laboratory, may often be broken down or minimized by study of plants in the field, or variations often found within a single colony which will help to solve puzzling relationships. Conversely, a study of a mass of material in the field may show that certain species or varieties seem to be quite distinct. Even with study in the field and of a large suite of herbarium specimens in the laboratory entities within the group, to no small extent, must be left to the judgment of the student of the group.

An attempt has been made to delimit the entities involved so that their distribution would coincide with that of similar entities in other groups, where such procedure could be logically followed. The publication of a monograph of this genus does not mean finality or that with it interest in the group ceases.

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[1] An investigation carried out at the Missouri Botanical Garden in the Graduate Laboratory of the Henry Shaw School of Botany of Washington University and submitted as a thesis in partial fulfillment of the requirements for the degree of doctor of philosophy in the Henry Shaw School of Botany of Washington University.

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There are still several imperfectly known and unsatisfactory entities which need further study both in the field and in the laboratory.

Manuals, floras, or other works in which species or varieties of *Mertensia* are given, often without synonymy or bibliography, are not cited in the text of this paper unless such citations are necessary for bibliographical reasons. It is felt that such citations would indicate acceptance of the various entities as delimited in those works, which is generally not the case. The more important publications are to be found in the generic synonymy.

The key to the species and varieties, as herein defined, is in no way an attempt to present a phylogenetic synopsis of the genus; but it is mainly an artificial key, which it is hoped will aid in the ready identification of the several taxonomic entities recognized. Some specific and varietal names will key out in different places, thus covering individual variations. Geographical lines have been used quite frequently; it is believed that these, as delimited, will be found to be sound.

HISTORY

The first species belonging to the genus *Mertensia* to be described were *M. maritima, M. virginica,* and *M. sibirica.* They were, however, treated by Linnaeus under the generic name *Pulmonaria.* Hill was the first to question the generic relationship of these three species and erected the genus *Pneumaria,* in 1764, to contain them. This generic name has been rejected. Roth, in 1797, described *Mertensia* and assigned to it one species, *M. pulmonarioides (= M. virginica).* This generic name has been conserved over the earlier one.

The next work of importance in which species of this genus were treated was that of Lehmann in 1818. He treated the previously mentioned species, as well as three others which had been described in the meantime, as *Lithospermum.* Between the time of Lehmann's work and that of G. Don in 'The General History of Dichlamydeous Plants,' in 1838, several more species were described by Pursh, Nuttall, Torrey, and James, all assigned to the genus *Pulmonaria.* In addition, three more generic names were proposed or mentioned. Don, in 1838 for the first time, treated most of the previously described species under *Mertensia.* A. DeCandolle in the "Prodromus," in 1846, continued the use of the name *Mertensia,* accrediting to the genus nineteen species, ten of which were North American. In the period between DeCandolle's treatment in the 'Prodromus' and that of Gray in the 'Synoptical Flora,' in 1878, two more genera were described to contain species of *Mertensia.* Only a few more species, based on North American material, were added. Two short papers by Gray appeared between 1840 and 1878, and for American species are the most important for the period. In the 'Synoptical Flora,' Gray maintained seven species and three varieties. This treatment well illustrates the difficulty that was had with the genus at that time.

Since the time of the 'Synoptical Flora' a great deal of collecting, exploration, and floristic work has been done in the West where the genus is most abundant. This has brought together a great mass of material and with it has come the descriptions of numerous species and varieties. Greene, Nelson, Rydberg, Piper, Heller, and Macbride have accounted for the majority of the increase; a few entities have been described by other botanists. With the exception of Macbride, these authors have, for the greater part, described the plants in connection with studies on the western flora. One of the most recent contributions to the literature of the genus is a paper by Macbride entitled "The True Mertensias of Western North America." This was the first attempt at a comprehensive review of the western species since Gray revised them for the 'Synoptical Flora.' In so far as Macbride was conversant with the difficulties to be encountered with the American borages his revision is of interest and is the best treatment of the genus up to that time. It is further of interest that Macbride knew many of the plants of which he wrote from field experience. The main disadvantage of the work is that he did not see enough material nor did he work that which was available to him carefully or critically. To these faults errors are due which might well have been avoided.

Since the publication of Macbride's paper, not a great deal has been done with the North American species except for a few descriptions of new material and a short paper by Johnston (Contr. Arnold Arb. No. 3, pp. 83–87. 1932) in which several entities are critically discussed.

MORPHOLOGY

Calyx.—A few valuable characters are offered in the calyx. The structure, whether divided almost to the base or campanulate, will separate a few species from the others, but this character is not always consistent. The shape and size of the lobes are of value in a general way and are specific in a few entities, even though they show much variation within species.

Corolla.—The differences to be found in the corolla are of a good deal of value. The relative lengths of the tube and the limb[1] provide a convenient method of separating groups in both the low and the tall species of the section Eumertensia. This character probably also indicates close relationship among species. In species which are di- or possibly trimorphic both conditions may prevail. Size of the corolla can be used to some extent but it is often subject to much variation. Some species which have large flowers early in the season may produce very much smaller ones later on in the season. In some entities the flowers continue to increase in size through the period of anthesis. The presence or absence of fornices is of value in the separation of a few species. The lack of fornices may indicate a fairly recent species. The presence or absence of a ring of hairs or of scattered hairs in the tube of the corolla is of some use in a general way but of little or no use in a specific way. As a character it is to be warily used because both conditions sometimes occur in the same inflorescence. Campanulate corollas seem to be constant and where found are of value. Coloration is of no value; it is usually blue, but flowers lacking the blue color are not uncommon.

Nutlets.—Unfortunately the nutlets do not seem to present the specific characters so often found in other members of the

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[1] For convenience the ''limb'' is used throughout this monograph to signify that portion of the corolla above the fornices although, technically, this is divided into throat and limb.

Boraginaceae. A few tendencies are manifest, but in only a few species do the nutlets show characters of unique value. Evidently in many species they are shed before they are completely ripe for mature fruit is rarely seen. Many of the smaller western species are inconspicuous after the flowers have fallen and consequently are seldom collected in the fruiting stage. The nutlets of specimens taken in immature fruit usually lose their shape or are crushed in drying.

Inflorescence.—The characters of the inflorescence are difficult of precise description and definition. In some species the branches of the inflorescence elongate with age to a marked degree; in others there is very little or no elongation.

Stamens.—Size and shape of anthers are of diagnostic value in a few species; in most species the size is fairly constant. The filaments are of some little value. A few species are set off from the others by having the stamens included in the corolla-tube.

Style.—The style presents little of specific value. In some species it is di- or possibly trimorphic.

Gynobase.—The gynobase is difficult of examination but seems to present little of specific value.

Indument.—The pubescence furnishes easily examined and obvious characters for diagnosis. It is not a fundamental character even though it has been widely used as a specific difference. The position, type, and abundance of the pubescence seem to be fairly constant and can be used to advantage in some species; in other species and varieties, notably those allied to *M. paniculata,* the pubescence presents a character which must be warily used. In entities where position and character of the indument seem to be constant, within limits, full advantage has been taken of it.

Leaves.—The shape and size of leaves are of some diagnostic value, but in some species are subject to a large range of variation. A tendency for the leaves to broaden with age is manifest in most species. A fairly constant character, but again one which is not absolute, is found in the venation of the leaves which will divide the species roughly into two groups.

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Venation.—Whether or not the cauline leaves have lateral veins visible is a general character of value in the separation of the genus into two groups. The tall species (see below) usually have distinct lateral veins in the cauline leaves while the low species do not. There is intergradation in this character, so it is not absolute or constant. The character of the venation is concomitant with the time of flowering and the habitat.

Time of flowering and habitat.—The tall species, which usually have lateral veins in the cauline leaves, generally flower in the late spring or in the summer and are usually found in moist and fairly well-shaded situations. The low species, which usually do not exhibit lateral veins in the cauline leaves, generally flower in the early spring and are to be found in drier more open habitats unless they occur at high altitudes when they of necessity flower later and are often found in moist situations. Some species may be somewhat limited in altitudinal range, others are quite cosmopolitan.

Stems.—Two groups of the Eumertensia may be set apart by the height of the stems: one group, having tall stems and lateral veins in the leaves; the other, having low stems and usually without apparent lateral veins in the cauline leaves. The character is empirical and intergradation between the two types is complete.

Roots.—The roots are usually large and fleshy, with numerous small fibrous roots. In some species the underground parts seem to be essentially rhizomes. In a few species the root is very much shortened and may be almost round.

PHYLOGENY

The phylogeny of the genus *Mertensia* in North America is apparently very complex. Among some species it might be possible to trace a fairly logical course of their evolution, but in the greater number of the species no such course can be traced with any degree of accuracy. Speculation on their phylogeny, while it would probably be interesting, would be of no great value. It is fairly safe to say, however, that the relationship between the entities is probably reticulate and not lineal or dendroid. Relationships and some probable phylogeny will be found in the discussion of some of the entities.

While it is not always possible to bring into juxtaposition those species which seem to be closely related, an attempt has been made to group species according to their affinities, thus having closely related groups together. This is true particularly of the section Eumertensia which contains most of the species, the sections Steenhammera and Neuranthia each containing a single species.

Generic Relationship

Mertensia, so far as the author is aware, has no very close generic allies. *Pulmonaria,* to which certain species of *Mertensia* were referred for a long time, is near *Mertensia* in facies. No species of that genus are known from the New World. Johnston, in his treatment of "The Old World Genera of the Boraginoideae," states of *Anoplocaryum* that it "appears to be a close ally of *Mertensia.*" That monotype is not known to the author.

In its tribal relationship *Mertensia* has been treated in essentially two ways. Bentham and Hooker, in the 'Genera Plantarum,' placed it in the subtribe Lithospermeae of the tribe Borageae. Gürke, in Engler and Prantl's 'Natürlichen Pflanzenfamilien,' included it in the tribe Lithospermeae of the subfamily Borraginoideae. Johnston, both in his treatment of "The Old World Genera of the Boraginoideae" and in his "Synopsis of the American Native and Immigrant Borages of the Subfamily Boraginoideae," placed *Mertensia* in the tribe Eritrichieae. The author is inclined to accept the latter disposition of the genus as more nearly correct.

Specific Concept

In the present study an attempt has been made to delimit the entities in such a way that they would be most logical and useful, although it is recognized that the species are not of uniform value. The course followed, it is thought, is a conservative one. The line of demarcation is, in many instances, difficult enough to draw and becomes increasingly so with further division. The differences between certain species, while not clearly and sharply definable, are most evident when their often distinct but intangible facies are taken in conjunction with morphological characters. The species, as here delimited, will in most cases be found to have ranges similar to those of species in other genera which have developed in the same region and under similar conditions. Among the varieties here maintained are many which, biologically, would seem not to belong in the same category. Some of them may have a natural range of their own, either distinct or within that of the species, and be distinguishable from the species on minutae of morphology. Others are sporadic, having no natural or limited range of their own, and are distinguishable by sporadic characters.

GEOGRAPHICAL DISTRIBUTION

In North America *Mertensia* has its greatest concentration in the western half of Colorado. Some twenty entities occur there, many of which are also found in the floristically related Uinta and La Sal Mountains in Utah. From Colorado the general range of greatest density extends west and northward. A second and smaller center of distribution occurs in northern Idaho and adjacent areas of Montana, Wyoming, Washington, and Oregon.

The majority of the entities are found in or not very far removed from the mountains, in the low hills. A few are typically plains plants but extend into the lower elevations of the mountains. The break in the continuity of the mountains, which occurs across Wyoming and north of the Uinta and south of the Wasatch Mountains in Utah, marks the boundary line across which some northern species have not crossed and also the northern limit of some southern species. In that region, and in other similar regions, some entities are found to be inconstant in their characters, even more so than elsewhere.

Species and varieties occurring in the high mountains of Colorado are often found across the plains region in the high mountains of Wyoming and Montana. Such distribution is well known in other genera.

Our knowledge of the Siberian species of *Mertensia* is still too fragmentary to permit discussion of their relationship or comparisons of the distribution areas with those of America.

ILLUSTRATIONS

Line drawings have been prepared illustrating the more difficult or interesting of the species. The drawings were made natural size and reduced in reproduction. Species vary greatly in size and consequently the amount of reduction varies. The drawings were all prepared by Dorothy D. Wynd.

ACKNOWLEDGMENTS

This study has been carried out at the Missouri Botanical Garden where the splendid library and herbarium were at all times placed at the disposal of the author. For these privileges and many others he is indebted to the Director, Dr. George T. Moore. Above all the author wishes to express his sincere appreciation and thanks to Dr. J. M. Greenman, Curator of the Herbarium of the Missouri Botanical Garden, for his invaluable assistance, encouragement, helpful criticism, and time, which were given without stint. To Dr. Ivan M. Johnston, the author is much indebted for many critical suggestions. To those in charge of the many herbaria, who have so freely loaned of the material in their charge, the author wishes to express his gratitude. Much assistance in many ways was rendered by the author's wife.

ABBREVIATIONS

The herbaria from which material has been available for study and from which specimens are cited in this monograph are indicated by the following abbreviations:

Herbarium of the New Mexico College of Agriculture and Mechanical Arts (AM); Herbarium of the Academy of Natural Sciences, Philadelphia (ANS); Herbarium of the University of Arizona (Ariz); Herbarium of Brigham Young University (BYU); Herbarium of the University of Colorado (C); Herbarium of the Carnegie Museum (Carnegie); Herbarium of the California Academy of Sciences (CAS); Herbarium of Cornell University (Cl); Ira W. Clokey, his personal herbarium (Clokey); Dudley Herbarium of Stanford University (Dudley Herb); Herbarium of the Field Museum of Natural History (F); Herbarium of the Colorado Agricultural College, Fort Collins (FC); Gray Herbarium of Harvard University (G); Herbarium of Kansas State College (K); Herbarium of the Royal Botanical Gardens, Kew (Kew); Herbarium of the Missouri Botanical Garden (M); Herbarium of the University of Nebraska (N); Herbarium Greeneanum at the University of Notre Dame (ND); Herbarium of the New York Botanical Garden, the Torrey Herbarium, and the Britton Herbarium (NY); George E. Osterhout, his personal herbarium (O); Herbarium of the University of Oregon (Ore); Herbarium of the State College of Washington, Pullman (P); Herbarium of Pomona College (Pom); Rocky Mountain Herbarium at the University of Wyoming (Ry); Intermountain Herbarium at the Utah State Agricultural College (U); Herbarium of the University of California (UCal); Herbarium of the University of Idaho (UIdaho); Herbarium of the University of Montana (UM); Herbarium of the University of New Mexico (NMex); United States National Herbarium (US); Louis O. Williams, personal collection (W); Herbarium of Willamette University (Willm); Herbarium of the Botanical Garden and Academy of Science, Leningrad (USSR), types of Siberian species, not cited.

TAXONOMY

GENERIC SYNONYMY AND DESCRIPTION

Mertensia Roth, Cat. Bot. **1**: 34. 1797, *conserved name;* G. Don, Gen. Hist. Dich. Pl. **4**: 318–320, 372. 1838; A. DC. in DC., Prodr. **10**: 87–93. 1846; Gray in Proc. Am. Jour. Sci. and Arts, II. **34**: 339–341. 1862; Porter & Coulter, Syn. Fl. Colo. 101. 1874; Gray in Proc. Am. Acad. N. S. **10**: 52–53. 1875; Bentham & Hooker, Gen. Pl. **2**: 857–858. 1876; Gray, Syn. Fl. N. Am. **2**^{1}: 199–201. 1878; Macoun, Cat. Can. Pl. pt. 2: 338–339. 1884; Coulter, Man. Bot. Ry. Mt. Reg. 262–263. 1885; Gürke in Engler & Prantl, Nat. Pflanzenf. **4**^{3a}: 119–121. 1893;

Britton & Brown, Ill. Fl. N. States and Canada **3**: 59–60. 1898; Rydberg in Mem. N. Y. Bot. Gard. **1**: 335–337. 1900; Howell, Fl. N. W. Am. 490–491. 1901; Britton, Man. Fl. N. States and Canada, 771–772. 1901, and ed. 2. 1905; Rydberg in Colo. Agr. Exp. Sta. Bull. [Fl. Colo.] 100: 289–292. 1906; Piper in Contr. U. S. Nat. Herb. [Fl. Wash.] **11**: 476–480. 1906; Robinson & Fernald in Gray's Man. Bot. ed. 7, 685. 1908; Nelson in Coult. & Nels., Man. Ry. Mt. Bot. 420–423. 1909; Piper & Beattie, Fl. N. W. Coast, 301–302. 1915; Wooton & Standley in Contr. U. S. Nat. Herb. [Fl. N. Mex.] **19**: 541–542. 1915; Macbride in Contr. Gray Herb. N. S. No. 48: 1–20. 1916; Rydberg, Fl. Ry. Mts. and Adj. Plains, 730–736. 1918, and ed. 2, 730–736, 1131–1132. 1923; Johnston in Contr. Gray Herb. N. S. No. 70: 46. 1924, and No. 73: 66–67. 1924; Tidestrom in Contr. U. S. Nat. Herb. [Fl. Utah and Nev.] **25**: 465–467. 1925; Skutch, Ann. N. Y. Acad. Sci. **32**: 1–52. 1930; Rydberg, Fl. Pr. and Pl. Cent. N. Am. 671–673. 1932; Victorin, Fl. Laurent. 456–457. 1935.

Pulmonaria L., Sp. Pl. 135–136. 1753, in part; Michaux, Fl. Bor.-Am. **1**: 131–132. 1803; Pursh, Fl. Am. Sept. **1**: 130–131. 1814, and ed. 2. 1816; Nuttall, Gen. N. Am. Pl. 115. 1818; Eaton, Man. Bot. N. Am., ed. 7, 467–468. 1836.

Lithospermum of authors, not L., Lehmann, Asperif. pars 2: 289–297. 1818; Pug. **1**: 26–27. 1828; in Hooker, Fl. Bor.-Am. **2**: 86–87. 1838.

Pneumaria Hill, Veg. Syst. **7**: 40, *pl. 37, fig. 1, a–b*. 1764, and new ed. 1824; Britton & Brown, Ill. Fl. N. States and Canada **3**: 59. 1898; Howell, Fl. N.W. Am. 491. 1901; Britton, Man. Fl. N. States and Canada, 771. 1901, and ed. 2. 1905.

Casselia Dumortier, Com. Bot. 21. 1822.

Steenhammera Reichb., Fl. Germ. Excurs. 337. 1831; Turczaninow in Bull. Soc. Nat. Moscow **14**: 241–251. 1840.

Platynema Schrad., Ind. Sem. Hort. Götting. 1835; Linnaea **11**: Litt.-Ber. 89. 1837.

Winkleria Reichb., Nom. Gen. 236. 1841.

Hippoglossum Hartm. ex Lilja in Linnaea **17**: 111. 1843.

Cerinthodes Ludwig, Defin. Gen. 5. 1737, ex O. Kuntze, Rev. Gen. Pl. pt. 2: 436. 1891.

Glabrous or pubescent caulescent perennial herbs with fleshy, fusiform, rhizome-like or corm-like roots. Leaves entire, linear to cordate, sessile or petiolate, alternate. Stems one to many from each root, decumbent to erect, usually unbranched below the inflorescence, 0.3–17 dm. tall. Inflorescence a lax or congested, ebracteate, unilateral, modified scorpioid cyme, or with the lowest flowers often single and subtended by leaves, often becoming panicled in age. Calyx 5-parted, occasionally campanulate, often accrescent. Corolla tubular, infundibuliform or campanulate, the expanded limb[1] exceeding or exceeded by the tube, with or rarely without fornices in the throat alternating with the stamens, blue, occasionally white or pink. Filaments attached below the throat, the anthers exserted or included. Style shorter or longer than the corolla, in some di- or trimorphic, the base often dilated slightly; the stigma entire or obscurely lobed. Ovary 2-celled, each cell 2-lobed. Nutlets 4, or by abortion fewer, attached laterally to the gynobase from one-fourth to one-half the distance above the base to the apex of the nutlet, the point of attachment usually elevated and twisted to one side, open or closed, usually rugose or pectinately rugose, coriaceous or in *M. maritima* smooth and shining, utricle-like. Gynobase[2] subtending the nutlets of 2 unequal pairs of lobes alternate with the nutlets and often intruding between them.

Type species: **Mertensia virginica** (L.) Pers. (*Mertensia pulmonarioides* Roth, Cat. Bot. **1**: 34. 1797).

KEY TO THE SECTIONS

A. Nutlets smooth, utricle-like; procumbent plants of the sea-shore and salt marshes....................................Section 1. STEENHAMMERA.
AA. Nutlets rugose, not utricle-like; mostly erect or ascending inland plants.
  B. Corolla not divided into a tube and a limb, campanulate, 10 mm. or less long..Section 2. NEURANTHIA.
  BB. Corolla divided into a tube and a limb, not campanulate, usually 10 mm. or more long or if shorter then the division into tube and limb well pronounced...Section 3. EUMERTENSIA.

Section 1. STEENHAMMERA (Reichb.) Gray in Proc. Am. Acad. N. S. **2**: [whole series **10**:] 52. 1874, as section. (Changed to *Stenhammaria.)*

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[1] See footnote on p. 20.

[2] cf. Moore, J. A. Morphology of the gynobase in *Mertensia*. Am. Midl. Nat. **17**: 749–752. 1936.

Steenhammera Reichb., Fl. Germ. Excurs. p. 337. 1831, as genus.

Nutlets smooth, utricle-like; leaves thick and fleshy; procumbent plants of the sea-shore and salt marshes.

A single species..*1. M. maritima*

Section 2. NEURANTHIA, n. sec.[1]

Nutlets rugose; corolla not divided into a tube and a limb, campanulate, 10 mm. long or less; roots corm-like, usually rounded, small; cauline leaves with lateral veins.

A single species..*2. M. bella*

Section 3. EUMERTENSIA Gray, *l.c.*

Nutlets rugose; corolla divided into a tube and limb, not campanulate, usually more than 10 mm. long, if less then definitely divided into a tube and limb; cauline leaves with or without lateral veins.

KEY TO SPECIES AND VARIETIES OF SECTION EUMERTENSIA

X. Plants usually with prominent lateral veins in the cauline leaves; stems usually 4 dm. or more tall (1–17 dm.); normally flowering in late spring and in the summer; mostly occurring in moist shaded situations. (XX on page 31.)
  A. Limb of the corolla longer than the tube; leaves usually acuminate. (AA on page 31.)
    P. Anthers 3.7–5 mm. long, usually curved.
      e. Calyx-lobes 5–7 mm. long, acute; plants of western Washington ....*6. M. platyphylla*
      ee. Calyx-lobes 2.5–4 mm. long, obtuse; plants of western Oregon. ....*6a. M. platyphylla* var. *subcordata*
    PP. Anthers rarely exceeding 3 mm. in length, usually straight.
      B. Nutlets *with* long subspinose processes; pubescence of both leaf-surfaces appressed; calyx-lobes glabrous.........*3. M. Eastwoodiae*
      BB. Nutlets *without* long subspinose processes; pubescence of the lower surface of the leaves spreading or none, that of the upper surface appressed or none, rarely spreading; calyx-lobes glabrous to densely pubescent.
        Y. Leaves pubescent at least on one surface.
          C. Leaves pubescent on both surfaces.
            D. Pubescence of lower surface appressed......*3. M. Eastwoodiae*

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[1] **Neuranthia**, n. sec., nucellis rugosis; corolla in tubo et limbo non divisa, usque ad 10 mm. longa, campanulata; radice parva orbiculata subtuberosa; foliis caulinis cum nervis lateralibus.

DD. Pubescence of the lower surface spreading or none.

E. Plants occurring only north of the 42nd parallel, not in Colorado, New Mexico, Utah, Arizona, or Nevada.

F. Cauline leaves lanceolate or ovate; calyx pubescent or glabrous on the back; plants from Quebec and Iowa to Alaska, south to Montana and Washington...... ....*4. M. paniculata*

FF. Cauline leaves linear to narrowly elliptic; calyx glabrous on the back; plants of Alaska and Yukon.... ....*4a. M. paniculata* var. *alaskana*

EE. Plants occurring only south of the 42nd parallel in Colorado, New Mexico, Utah, Arizona, and Nevada.

G. Pubescence of both surfaces of the leaves and of the pedicels spreading; leaves oblong-lanceolate to elliptical..............................*7. M. toyabensis*

GG. Pubescence of both surfaces of the leaves not spreading; leaves not oblong-lanceolate to elliptic.

H. Calyx not accrescent, margins densely ciliate, backs pubescent or glabrous..............*5. M. franciscana*

HH. Calyx accrescent, margins not densely ciliate, backs glabrous...............*8c. M. arizonica* var. *subnuda*

CC. Leaves pubescent only on one surface.

I. Leaves glabrous above.

J. Calyx-lobes acute, accrescent...*4b. M. paniculata* var. *borealis*

JJ. Calyx-lobes obtuse, not accrescent..................... ....*12a. M. ciliata* var. *subpubescens*

II. Leaves glabrous below.

K. Calyx not accrescent, margins of the lobes densely ciliate ....*5. M. franciscana*

KK. Calyx accrescent, margins of lobes not densely ciliate.

L. Plants from south of the 42nd parallel............... ....*8c. M. arizonica* var. *subnuda*

LL. Plants from north of the 42nd parallel.............. ....*4b. M. paniculata* var. *borealis*

YY. Leaves glabrous on both surfaces.

a. Calyx campanulate, lobes shorter than the tube.

b. Cauline leaves rapidly reduced upward; fornices none or inconspicuous; plants of Idaho............*10. M. campanulata*

bb. Cauline leaves not rapidly reduced upward; fornices conspicuous; plants of Colorado, Utah, and possibly Arizona.

‡. Corolla 13–20 mm. long; base of anthers higher than the fornices; plants of Utah and possibly Arizona........ ....*8. M. arizonica*

‡‡. Corolla 9–13 mm. long; base of anthers opposite the fornices; plants known only from Colorado.............. ....*8b. M. arizonica* var. *Grahami*

aa. Calyx not campanulate, lobes longer than the tube.

c. Plants occurring only south of the 42nd parallel.

y. Plants of Mexico............................*9. M. mexicana*

yy. Plants of Wyoming, Colorado, or Utah.

d. Base of the anthers opposite the fornices; corolla 9–13 mm. long; plants of Colorado...*8b. M. arizonica* var. *Grahami*

dd. Base of the anthers higher than the fornices; corolla 13–20 mm. long; plants of Wyoming and Utah..............................*8a. M. arizonica* var. *Leonardi*

cc. Plants occurring only north of the 42nd parallel...*4b. M. paniculata* var. *borealis*

AA. Limb of the corolla shorter than the tube or the two about subequal; leaves usually not acuminate.

f. Leaves pubescent at least on one surface.

g. Leaves pubescent only below; calyx-lobes obtuse..*12a. M. ciliata* var. *subpubescens*

gg. Leaves pubescent above or on both sides; calyx-lobes 2.5–7 mm. long, usually acute.

h. Pubescence of both surfaces of the leaves and of the pedicels spreading......................................*7. M. toyabensis*

hh. Pubescence of the upper surface of the leaves and of the pedicels appressed.....................................*5. M. franciscana*

ff. Leaves glabrous on both surfaces, sometimes the upper surface papillate.

i. Corolla-tube 11–21 mm. long, very narrow; plants east of the 95th parallel..*11. M. virginica*

ii. Corolla-tube 12 mm. or less long, not very narrow; plants west of the 95th parallel.

j. Calyx not campanulate, the lobes longer than the tube; fornices conspicuous.

k. Calyx-lobes obtuse or acutish, ovate or oblong, 1.5–6 mm. long.

l. Calyx-lobes 1.5–3 mm. long, sinus usually open; style usually not exceeding the corolla; plants not of California and closely adjacent Nevada.........................*12. M. ciliata*

ll. Calyx 2.5–6 mm. long, sinus usually closed; style usually exceeding the corolla; plants of California and closely adjacent Nevada.............*12c. M. ciliata* var. *stomatechoides*

kk. Calyx-lobes acute, lanceolate to triangular, 3.7–7 mm. long.

m. Anthers 1–1.5 mm. long; corolla 10–14 mm. long; plants of Idaho.........................*12b. M. ciliata* var. *latiloba*

mm. Anthers 1.5–2.5 mm. long; corolla 15–21 mm. long; plants of Washington and Oregon................*13 M. umbratilis*

jj. Calyx campanulate, the lobes shorter than the tube; fornices inconspicuous; plants of Idaho.................*10. M. campanulata*

XX. Plants usually *without* lateral veins in the cauline leaves, some specimens of *M. oblongifolia* var. *nevadensis* excepted; stems usually less than 4 dm. tall; normally flowering in early spring, later when growing in the mountains, but commonly as soon as the snow and temperature permit; mostly occurring in fairly dry open habitats or if in the mountains often in moist or wet situations.

A. Filaments attached in the corolla-tube, the anthers not projecting beyond the throat, *i. e.* contained within the tube.
  B. Leaves pubescent on the upper surface, glabrous below.
    C. Backs of the calyx-lobes and the stems pubescent; plants not alpine or subalpine....................................*16. M. brevistyla*
    CC. Backs of the calyx-lobes and the stems glabrous; plants alpine or subalpine..*18. M. alpina*
  BB. Leaves glabrous on both surfaces......................*17. M. humilis*
AA. Filaments attached near the throat of the corolla-tube, anthers projecting beyond the throat, *i. e.* not contained in the tube.
  C. Limb of the corolla longer than or subequal to the tube.
    D. Leaves strigose only above or glabrous on both surfaces.
      E. Filaments shorter than the anthers; calyx divided quite to the base; style usually not reaching the anthers; anthers straight; leaves strigose above; plants usually alpine or subalpine, sometimes of lower altitudes and then more densely strigose.
        F. Cauline leaves not unilateral....................*19. M. viridis*
        FF. Cauline leaves unilateral........ *19d. M. viridis* var. *parvifolia*
      EE. Filaments longer than the anthers; calyx not divided quite to the base; style usually reaching or surpassing the anthers; anthers usually curved; leaves strigose above or glabrous; plants usually not alpine or subalpine.
        G. Calyx divided about two-thirds or more the way to the base.
          H. Roots fusiform; calyx pubescent on the back; leaves usually densely strigose above, the hairs directed toward the nearest margin of the leaf..*15. M. fusiformis*
          HH. Roots not fusiform; calyx glabrous on the back; leaves glabrous to rather densely strigose on the upper surface, the hairs usually directed toward the apex of the leaf.....................*14. M. lanceolata*
        GG. Calyx divided less than halfway to the base, usually forming a campanulate cup.
          I. Plant entirely glabrous on the surface; plants of Larimer Co., Colorado....*14b. M. lanceolata* var. *brachyloba*
          II. Plants with the leaves densely pubescent on the upper surface, usually on the calyx and often on the stem; plants of southern Colorado and adjacent New Mexico...............*14c. M. lanceolata* var. *Fendleri*
    DD. Leaves pubescent on both surfaces.
      J. Calyx divided one-half or less the way to the base; plants of New Mexico and adjacent Colorado.......................
      ....*14d. M. lanceolata* var. *pubens*
      JJ. Calyx divided two-thirds or more the way to the base; not of New Mexico.
        K. Cauline leaves linear to broadly lanceolate; plants of the plains, Wyoming and Colorado......................
        ....*14a. M. lanceolata* var. *secundorum*

KK. Cauline leaves linear to narrowly ovate; plants of the high mountains, Colorado and probably Utah...*19e. M. viridis* var. *cana*

CC. Limb of the corolla shorter than the tube.

L. Nutlets with the margins elevated, forming a tumid ring toward the inner surface; plants of Arizona..........*21. M. MacDougalii*

LL. Nutlets without the margins elevated and without a tumid ring; plants not of Arizona.

M. Tube of the mature corolla only slightly longer than the limb; plants mostly south of the 42nd parallel and in the mountains, or if north of it to be found at high elevations in the mountains of Montana and Wyoming. (If corollas immature see also MM.)

N. Leaves pubescent only above, or glabrous on both surfaces.

O. Leaves strigose above.

P. Plants usually erect; leaves not unilateral, usually quite glaucous.

Z. Pubescence of pedicels appressed..........*19. M. viridis*

ZZ. Pubescence of pedicels spreading. ....*19c. M. viridis* var. *cynoglossoides*

PP. Plants usually ascending; leaves usually unilateral, not glaucous................*19d. M. viridis* var. *parvifolia*

OO. Leaves glabrous on both surfaces.

R. Calyx mostly 4–5 mm. long; plants of southeastern Wyoming, adjacent Colorado, and Uinta Mountains, Utah......................*19a. M. viridis* var. *dilatata*

RR. Calyx mostly 6–7 mm. long; plants of northern New Mexico..................*19b. M. viridis* var. *caelestina*

NN. Leaves pubescent on both surfaces.

S. Leaves usually unilateral, 1.5–3 cm. long; stems ascending; plants of north-central Colorado, probably also in Utah...........................*19e. M. viridis* var. *cana*

SS. Leaves not unilateral, usually larger than above; stems more erect; plants of the mountains of Colorado, adjacent Utah, and adjacent New Mexico.

T. Calyx usually densely pubescent on the back and margins; pubescence of the upper surface of the leaves appressed; plants usually drying sordid brown, the corollas drying purple. (Plants in the Uinta Mountains, Utah, are often much less pubescent than typical forms).........................*20. M. Bakeri*

TT. Calyx usually glabrous on the back; pubescence on both surfaces of leaves spreading; plants usually drying green and the corollas drying blue.......................................*20a. M. Bakeri* var. *Osterhoutii*

MM. Tube of mature corolla usually much longer than the limb; plants mostly north of the 42nd parallel, or if south of it then on the plains or low hills.

U. Roots shallow-seated, tuberous; leaves usually obtuse and not more than three times longer than broad, glabrous to densely strigose........................*24. M. longiflora*

UU. Roots not as above; leaves usually acute and more than three times longer than broad, except in *M. oreophila* obtuse and usually less than three times longer than broad.

  V. Leaves pubescent, at least on one surface.

    W. Leaves pubescent above, glabrous below...*22. M. oblongifolia*

    WW. Leaves pubescent on both surfaces.....................................*22b. M. oblongifolia* var. *amoena*

  VV. Leaves glabrous on both surfaces.

    a. Leaves commonly more than three times longer than broad, acute, usually thin; plants of the plains or low foothills, widespread..*22a. M. oblongifolia* var. *nevadensis*

    aa. Leaves usually less than three times longer than broad, obtuse, subcoriaceous; plants of the Big Horn Mountains, Wyoming.........................*23. M. oreophila*

1. **Mertensia maritima** (L.) S. F. Gray, Nat. Arr. Brit. Pl. **2**: 354. 1821.

M. parviflora G. Don, Gen. Hist. Dich. Pl. **4**: 320. 1838.

M. maritima forma *albiflora* Fernald in Rhodora **23**: 288. 1922.

Pulmonaria maritima L., Sp. Pl. 136. 1753, and ed. 2, 195. 1762.

P. parviflora Michx., Fl. Bor.-Am. **1**: 131. 1803.

Pneumaria maritima Hill, Veg. Syst. **7**: 40, *pl. 37, f. 3.* 1764, and new ed. 1824.

Lithospermum maritimum Lehm., Asperif. pars 2: 291. 1818.

? *L. pumilum* Lehm., *l.c.* 319.[1]

Casselia maritima Dumort., Com. Bot. 25. 1822.

C. parviflora Dumort., *l.c.*

Steenhammera maritima Reichb., Fl. Germ. Excurs. 337. 1831.

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[1] *L. pumilum* Lehm.—A photograph, in U. S. Nat. Herb. and in the Gray Herb., purporting to be one of a fragment of the type of this species contained in the herbarium at Berlin, taken by E. P. Killip in 1925, is doubtless *M. maritima.* However, Lehmann's description does not fit this species. It is probable that he had some other species at hand, or more probable some genus other than *Mertensia.* Lehmann no doubt knew *M. maritima* rather well, and the possibility that he would redescribe it is not very great.

Hippoglossum maritimum Hartm., Handb. Scand. Fl. (ed. 2. 1832 ?), ed. 4. 66. 1843.

Cerinthodes maritimum O. Kuntze, Rev. Gen. Pl. pt. 2: 436. 1891.

Spreading or decumbent, the stem 0.5–10 dm. long; leaves more or less fleshy, ovate, spatulate or ovate-obtuse to acuminate, 2–10 cm. long including the petiole, 0.3–5 cm. broad, sparingly to densely papillose above, glaucous or eglaucous; pedicels 2–30 mm. long; calyx 2–6 mm. long, 1–4 mm. broad at the base, becoming enlarged in fruit, the lobes oblong to triangular, acute; corolla-tube short, 2–5 mm. long, scarcely exceeding the calyx-lobes; corolla-limb 1.5–4 mm. long, slightly broader than the tube; filaments inserted on the tube and exceeding the fornices, longer and narrower than the stamens; style 2–5 mm. long, shorter than the corolla-tube, slightly exceeding the nutlets in fruit; stamens 0.75–1 mm. long, about 0.25 mm. broad; fornices small or nearly absent; nutlets smooth, carinose, acute at the apex, raphe small, orbicular, near base of nutlet.

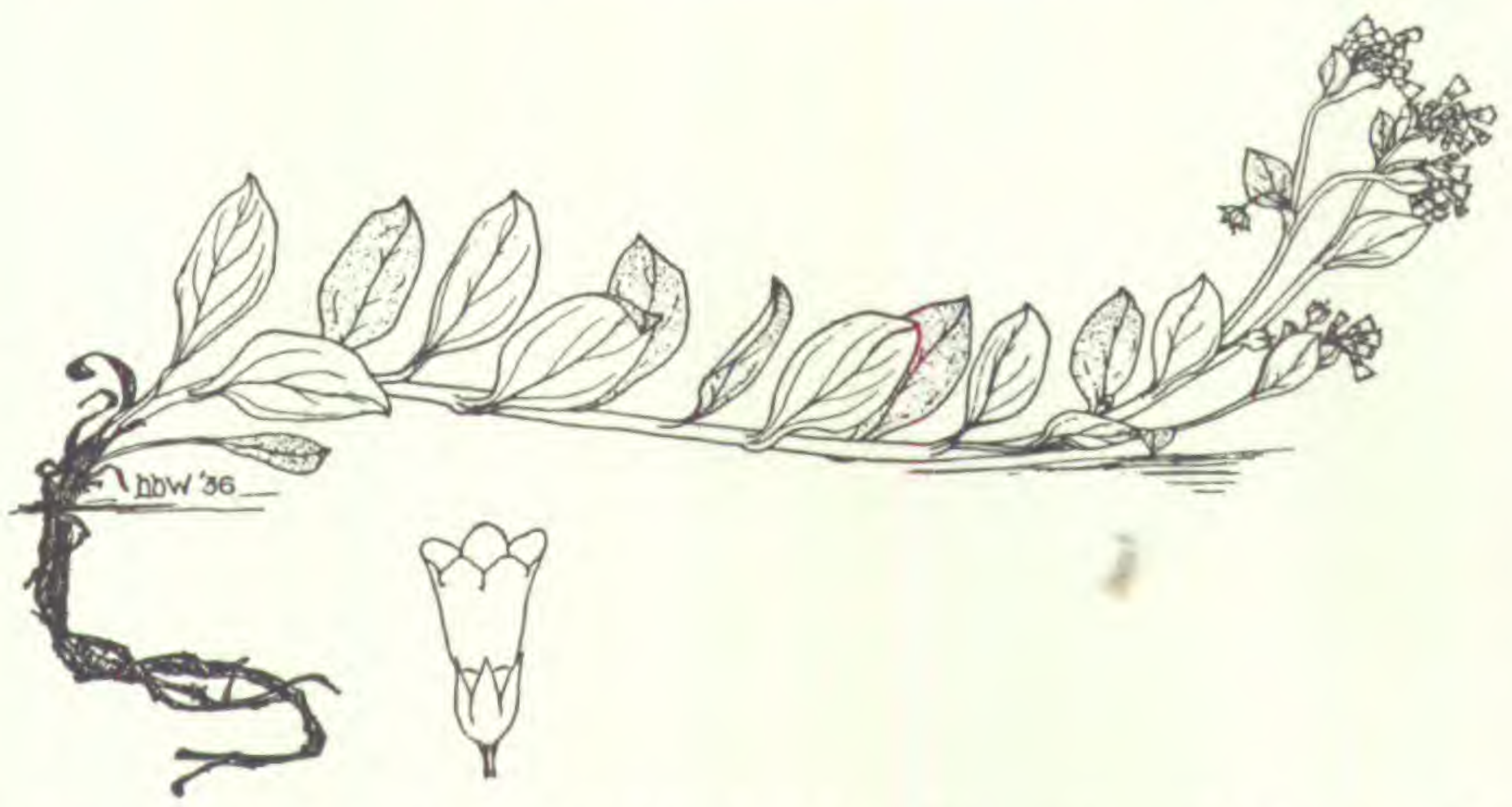

Fig. 1. *M. maritima.* Habit sketch × ⅓; enlarged flower × 1⅔.

Distribution: Massachusetts to Alaska and adjacent islands, possibly south to Vancouver Island, along the sea-shore and in salt marshes; Greenland, Baffin Island, Disco Island; Eurasia.

GREENLAND: Godhavn, 1870, *Andersson* (G); Disco Island, 1891, *Burk 48* (M, US); Disco Island, Aug. 2, 1896, *Cornell Party* (Cl, US, M); delta at mouth of gorge near Igloos, Sonntag Bay, region of Etah, Aug. 24–29, 1914, *Ekblaw 616* (M, US, G, CAS); Pingoarsuk, July 3, 1888, *Hansen* (M); sandy beach, Godhavn, July

16, 1925, *Koelz 60* (US); Disco Island, 1877–8, *Krumlein* (G); Saduarak, July 8, 1883, *Lylow* (G); Disco and Gothaab, July 14, 1892, *Meehan 53* (G, US); Godhavn, Disco, Sept. 10–20, 1922, *Porsild* (G); Disco, 1924, *Porsild 417* (US, G, M); Disco, Kutolisat, Aug. 7, 1902, *Porsild* (US, G); Disco, 1918, *Porsild* (G); Ingnerit Fjord, Nordsiden, Disco, July 9, 1934, *Porsild* (UCal, M); Godhavn, Disco, Aug. 1, 1898, *Simmons 92* (G); Disco, *Vahl* (G); not very abundant, Cape York, northwest Greenland, July 23, 1894, *Wetherill 59* (G).

FRANKLIN DISTRICT: north side of White Island, Frozen Straits, Aug. 9, 1933, *Angel 33* (US); sandy shores, Cape Prince of Wales, Hudson Strait, Aug. 21, 1884, *Bell* (US); Hudson Strait, 1885, *Bell* (G); Bernard Harbour, Aug. 1915, *Johansen 370* (G); sandy sea-shore, Pangnirtung, Cumberland Gulf, Baffin Island, Aug. 21–22, 1927, *Malte* (G); Lake Harbour, Baffin Island, Aug. 25–26, 1927, *Malte* (G); in sand on sea-shore, Cape Dorset, Baffin Island, Aug. 4, 1928, *Malte* (G); Bowdoin Harbor, Baffin Land, June 10, 1922, *Robinson 16* (G); Signuia near Cape Haven, Aug. 1–2, 1897, *White & Schuchert 100* (US).

LABRADOR: northern Labrador, coll. of 1873, *Anspach* (M); Sumavik, July 18, 1925, *Bartlett 13* (US); sea beach, Percoliak Island, Nain Bay, Aug. 3, 1928, *Bishop 522* (G); Red Bay, July 12, 1891, *Bowdoin College 43* (G); Chateau Bay, July 14, 1891, *Bowdoin College 73* (G); Webeck Harbor, Aug. 4, 1891, *Bowdoin College 210* (G); Battle Island, July 24, 1913, *Ekblaw* (G); Winter Harbour, 20 miles north of Hopedale, July 19–24, 1933, *Gardner 129* (G); Nain, July, 1927, *Sewall 161* (US, G); Anatolak, June, July, Aug., 1928, *Sewall 356* (G, US, CAS, M); sandy beach, Hopedale, Aug. 4–6, 1897, *Sornborger 51* (US, M, Ry, G); Rama, July–Aug., 1899, *Stecker 330* (US, G, Ry, M); sea beach, east of Wodeise, Aug. 12, 1894, *Waghorne* (M, US); on granitic rock, north shore of Duck Bight, 1 km. north of Ryan's Bay, Aug. 24, 1926, *Woodworth 358* (G); on granitic rock, at head of main arm of Ekortiarsuk Bay, Aug. 20, 1926, *Woodworth 359* (G).

NEWFOUNDLAND: Funk Island off the east coast of Newfoundland, July 2–12, 1906, *Bryant* (G); Ward's Harbor, Notre Dame Bay, Sept. 1, 1906, *Bryant* (G); upper border of limestone shore, Flower Cove, Straits of Belle Isle, Aug. 2, 1924, *Fernald, Long & Dunbar 26994* (G); upper border of gravelly strand, Woody Island, Bay of Islands, Sept. 3, 1926, *Fernald, Long & Fogg 387* (G); cobbly barrier-beach, Great Barachois (or Barasway Bay), District of Burgeo and La Poile, Sept. 11, 1926, *Fernald, Long & Fogg 388* (G); conglomerate limestone and calcareous sandstone cliffs and ledges, Cow Head, Silurian Coastal Region north of St. Paul's Bay, July 23, 1910, *Fernald & Wiegand 3923* (Cl, G); gravelly strand of Ingornachoix Bay, Aug. 2, 1910, *Fernald & Wiegand 3924* (G); pebbly beach, Little Bell Island, near Topsail, Conception Bay, Aug. 12–19, 1901, *Howe & Lang 1257* (G); Funk Island, July 23, 1887, *Palmer* (US); among the rocks by the seashore, Flowers' Cove, July 12, 1920, *Priest* (G); Barred Islands, Aug. 12–13, 1903, *Sornborger* (G, US).

NOVA SCOTIA: sandy beach, Signey Mines, Cape Breton Co., Aug. 28, 1920, *Bissell & Linder 22345* (G); rocky barrier beach, Markland (Cape Forchu), Yarmouth Co., July 13, 1921, *Fernald, Bartram, Long & Fassett 24411* (G); gravelly beach of Great Bras d'Or, Kidstone Island, Victoria Co., Aug. 28, 1920, *Fernald & Long 22347* (G); abundant and uniform on crest of barrier, East Jordan, Shelburne Co., Aug. 4, 1921, *Fernald & Long 24412* (G); gravelly beach of Bras d'Or Lake, Grand Narrows, Cape Breton Co., July 20, 1914, *Fernald & St. John 11165* (G); Canso, Aug. 5, 1901, *Fowler* (US); pebbly upper beach, Yarmouth, June

22–29, 1901, *Howe & Lang 23* (G, Ry); near mouth of the Barrasois River, Cape Breton Island, July–Aug., 1915, *Nichols 1254* (G); sand-beach beyond West Landing, St. Paul Island, Aug. 8, 1929, *Perry & Roscoe 332* (US, G); Cape Anns Bay, Cape Breton, Aug. 26, 1928, *von Schrenk* (M).

NEW BRUNSWICK: sandy shore of Nepisiguit Bay, Bathurst, Gloucester Co., Aug. 13, 1913, *Blake 5394* (G, Cl, US); Point Lepreaux, Sept. 1885, *Brewster* (G); Cranberry Road, Mt. Desert, Sept., 1905, *Crocker* (G); salt marsh, Salisbury Bay, Harvey, Albert Co., Aug. 22, 1924, *Fassett 2262* (G); salt marsh, Quaco, St. John Co., Aug. 21, 1924, *Fassett 2263* (G); Bathurst, July 23, 1873, *Fowler* (M); Eel River, Aug. 3, 1873, *Fowler* (M); Eel River, Restigouche, Aug. 4, 1873, *Fowler* (M); St. Andrew's, July 28, 1900, *Fowler* (G); Campobello Island, July 17–Aug. 20, 1888, *Smith* (US, UCal); The Wolves near Campobello Island, Sept. 1898, *Sturgis* (US, G); top of beach, Castalia, Grand Menan, Charlotte Co., Aug. 7, 1926, *Weatherby & Weatherby 5533* (Cl, G, US); sand dunes, Bathurst, Gloucester Co., July 24, 1902, *Williams & Fernald* (G).

QUEBEC: Middle Island, St. Mary's Island, Aug. 5, 1929, *Abbe 1247* (G); east coast of Hudson's Bay, coll. of 1879, *Bell 133* (G); on moist beach, north shore, Matamek River District, Aug. 3, 1927, *Bowman 288* (G); gravelly beach, Carleton Point, Carleton, Bonaventure Co., July 21, 1904, *Collins & Fernald* (G); gravelly beach, Tracadigash Point, Carleton, Bonaventure Co., July 25, 1904, *Collins & Pease 4474, 4475* (G); dry gravelly beach near the Lobster Hatchery, Grindstone, Grindstone Island, Magdalen Islands, July 22, 1912, *Fernald, Bartram, Long & St. John 7958* (G); sand beach near the wharf, Seven Islands, Saguenay Co., Sept. 9, 1925, *Fernald & Long 28954* (G); beach at base of dry talus of slaty cliffs, northern face of Mt. St. Pierre, at mouth of Rivière à Pierre, Gaspé Co., Aug. 14, 1923, *Fernald & Smith 25992* (G); shore of the St. Lawrence, Rivière Blanche, Gaspé Co., Aug. 3–8, 1904, *Forbes* (G, Ry); Little Metis, July 12, 1906, *Fowler* (G); Anticosti, 1861, *Hyatt, Shaler & Verrill* (G); Entry Islands, Magdalen Islands, Aug. 16, 1917, *Johansen* (G); Tadoussac, Saguenay, Aug. 5, 1892, *Kennedy* (G, Cl); gravelly seashore, Wakeham Bay, Hudson Strait, July 24, 1933, *Malte 157* (G); sandy seashore, Wolstenholme, Hudson Strait, Aug. 26, 1928, *Malte 1110* (G); St. Lawrence R., Rivière du Loup, July 10, 1903, *Pease 2482* (G); sandy beaches of the St. Lawrence, Temiscouata, Aug. 7, 1879, *Pringle* (Ry, M, US); Seven Islands, Aug. 4, 1907, *Robinson 730* (G); rocky beach, Point au Maurier, Charnay, Saguenay Co., Aug. 23, 1915, *St. John 90690* (G); Mingan, Saguenay Co., June 1909, *Townsend* (G); Rivages de Cacouna, juillet, 1913, *Victorin 7* (G); Isle-aux-Coudres, juin, 1917, *Victorin 4203* (US, G); sur les rivages calcaires, Ile à Bouleau, Archipel de Mingan, du Golfe Saint-Laurent, 4 aout, 1924, *Victorin & Germain 18 443* (G); sur les dunes à l'est du village, Pointe-aux-Esquimaux, du Golfe Saint-Laurent, 14 juillet, 1924, *Victorin & Germain 18 444* (G); sur les rivages calcaires, une colonie etendue, Ile Niapisca, Archipel de Mingan, du Golfe Saint-Laurent, 30 juillet, 1924, *Victorin & Germain 18 610* (NY, G); sur les sables du littoral, la Peninsule, Baie de Gaspé, 17 juillet, 1923, *Victorin, Germain, Brunel, & Rousseau 17 315* (G); Double Mer, south shore, about 10 miles above the mouth, Hamilton Inlet, Aug. 17, 1921, *Wetmore 103040* (G); gravelly sea-beach, Metis to Matane, Matane Co., Aug. 27, 1924, *Wiegand & Wiegand 287* (Cl).

ONTARIO: sandy beach, bay west of Point Comfort, July 21, 1929, *Potter 695* (G).

MAINE: beach, York, July 23, 1863, *Blake* (M); Machias, Aug. 20, 1888, *Chick-*

ering (US); York Beach, York, Sept. 5, 1887, *Deane* (US, G); sea wall, Mt. Desert, July 9, 1896, *Faxon* (G); Great Cranberry Island, July 10, 1894, *Faxon & Faxon* (G); Wells Beach, 1879, *Furbish* (G); Bay of Fundy, Sept. 1885, *Gilbert* (UCal); on border of sandy grassland, coast of Maine, Aug., 1896, *Harvey & Harvey* (US); Cutler, Washington Co., July 3, 1902, *Kennedy, Williams, Collins & Fernald* (G); sea-beach in gravel, Roque Bluff, Washington Co., July 12, 1908, *Knowlton* (UCal); along shore, Prospect Harbor, July 8, 1898, *Larabee 687* (US); Matinicus Island, Nov. 2, 1915, *McAtee* (US); growing amid rocks on coast, Pemaquid Point, Lincoln Co., Aug. 1930, *McMullen* (Cl); Owl's Head, Aug. 20, 1902, *Moore 330* (UCal); near Southwest Harbor, Mount Desert, Hannock Co., July 2, 1928, *Perkins* (Cl); beaches, Seal Harbor, Mt. Desert Island, July 21, 1882, *Redfield* (M); Grand Menan, *Rothrock* (Cl); on gravelly shore, near Owl's Head, Knox Co., July 8, 1930, *Steyermark 994* (M); Vinal Haven, Aug. 1, 1891, *Watson* (G); Little Cranberry Island, July 24, 1899, *Williams 1* (G).

NEW HAMPSHIRE: Gilmanton, 1867, *Blake* (US); Isles of Shoals, Aug., 1864, *Canby* (US); Isles of Shoals, Aug., 1866, *Canby* (Cl); Rye, July 1, 1888, *Davis* (UCal, M).

MASSACHUSETTS: sandy sea-shore, Surf Side, Nantucket, July 13, 1884, *Deane* (G); south shore inland, July 13, 1884, *Deane* (G); on beach near Horsebeach Pond, east coast, Wellfleet, Barnstable Co., Sept. 3, 1935, *Johnston* (G).

KEEWATIN DISTRICT: Depot Island, northwest coast, Hudson Bay, Sept. 1893, *Comer* (Ry, G); Whale Point, northwest coast, Hudson Bay, July 1894, *Comer* (G); près de la Mission, Chesterfield, 13 aout, 1933, *Gardner 374* (G); Roes Welcome, Whale Point, N. W. Terr., Hudson Bay area, July 2, 1923, *Preuchier 670b* (US).

MACKENZIE DISTRICT: Cape Bathurst, July 26, 1916, *Johansen 513* (US).

ALASKA: Ft. St. Michaels, Norton Sound, 1865–66, *Bannister* (US, Cl, G); Sitka, 1865–66, *Bischoff* (Cl, G); sandy soil, Gambell, St. Lawrence Island, July 2, 1902, *Campbell* (US); St. Lawrence Island, Aug. 2, 1902, *Campbell* (M, US); west of Martin Point, July 1914, *Canadian Arctic Expedition 146* (US); beach beyond Gold Creek, Juneau, July 31, 1891, *Cooley* (G, US); Glacier Bay, Aug. 23, 1921, *Cooper 97* (US); Egg Island, Disenchantment Bay, June 21–22, 1899, *Coville & Kearney 1056* (US); Kukak Bay, Alaska Peninsula, July 1–5, 1899, *Coville & Kearney 1683* (US); Sturgeon River, "Kadiak Island," July 19, 1899, *Coville & Kearney 2239* (US); beach, Skagway, July 29, 1907, *Cowles 851* (M, US); Amchitka, July 25, 1873, *Dall* (G); along beach, Skagway, July 21, 1914, *Eastwood 741* (CAS, G); Muir Glacier moraine, June 29, 1897, *Evans 160* (US); Homer, Cook's Inlet, July 11, 1897, *Evans 307, 308* (US); sandy places near beach, Kussiloff, July 1898; *Evans 700* (US); Unalaska, June 9–14, 1892, *Evermann 18* (US); "Kadiak Island," July 2–4, 1899, *Fernow* (Cl); west of the bay, 10 kilometers north of Point Manby, June 28, 1892, *Funston 50* (Cl, G, M, P, UCal, US); Nelson's Lagoon, June 28, 1900, *Golder 63* (US); Lake Iliamna region, 1902, *Gorman 102* (CAS, NY, G, US); on shingly sea-beach at Cottonwood Bay, Lake Iliamna region, Aug. 26, 1902, *Gorman 277* (US); on the strand, Homer, Cook Inlet, June 5, 1913, *Griggs* (US); Katmai Region, Kasuik Bay Strand, July 6, 1917, *Hagelbarger 112* (US); Tolstoi sand dunes, Pribilof Islands, St. Paul, Sept. 4, 1910, *Hahn 44* (US); North East Point near "Salt Horse," St. Paul, Pribilofs, July 6, 1925, *Haley* (UCal); Nome, June 23–27, 1926, *Haley* (CAS); St. Paul Island, 1919, *Haley & Haley* (CAS); St. Matthew Island, July 8–13, 1916, *Hanna* (NY, US); St. Paul

Island, Aug. 1–15, 1920, *Hanna* (CAS, Clokey); on beach, Goodnews Bay, July 10, 1919, *Harrington 36* (US); St. Michael, July 30, 1917, *Harrington 88* (US); Unalaska, 1871-72, *Harrington* (M, US); beach, Ungad, Shemagin, July 15, 1872, *Harrington* (G); Dalls Survey, 1873, *Harrington* (US); Nunivak Island, July 1927, *Harrold* (CAS); salt beach, Karluk Spit, June 1901, *Horne* (NY); Iluilink, Aleutian Islands, June 26, 1899, *Jepson 230* (G, US); west of Martin Point, July 1914, *Johansen 146* (G); vicinity of Unalakleet, Norton Sound, Aug. 1920, *Johnston & Palmer 15* (G, US); Kodiak, 1867, *Kellogg* (M); Kodiak, 1867, *Kellogg 270* (NY, US); ''Russian America,'' coll. of 1866, *Ketchum* (NY); Yukon River Country, ''Russian America,'' 1867, *Ketchum* (G); St. Paul Island, Behring Sea, July 19, 1897, *Macoun* (Cl); Pt. Barrow, July 11, 1898, *McIlhenny 96* (Ry); St. Paul Island, Pribilof Islands, Bering Sea, July 30, 1891, *Merriam* (US, NY); Unalasachka, *Mertens* (G); head of Kotzebue Sound, 1881, *Muir 60* (G); Pt. Barrow, Coglamie, arctic shore of Alaska, *Murdock* (M); Homer, Aug. 16, 1904, *Piper 4441* (US); vicinity of Karluk, ''Kadiak Island,'' July, 1903, *Rutter 212* (CAS, US, M, G); Alaskan Peninsula, July 5, 1899, *Saunders 4809* (M); sandy shores, Popoff Island, Shumagin Islands, July 15, 1899, *Saunders 4810* (M); Pitchfork Falls above Skagway, July 14, 1930, *Setchell & Parks* (UCal); Salmon Creek, July 31, 1891, *Shumway* (G); beach, Bering Island, *Stejneger 48* (US); Coppermine Cove, Glacier Bay, July 19, 1907, *Stephens 1* (UCal); vicinity of Nome, July 31, 1919, *Thornton 411* (US); Akun Island, Aug. 31, 1893, *Townsend* (US); beach, Muir Glacier, Glacier Bay, June 9, 1899, *Trelease 4806* (M); Sturgeon River Bay, ''Kadiak Island,'' July 19, 1899, *Trelease 4807, 4807a* (M); Kodiak, ''Kadiak Island,'' July 20, 1899, *Trelease 4808* (M); in sand just back of sea beach, Dutch Harbor, Unalaska, June 29, 1907, *Van Dyke 69* (G); seashore, Nazan Bay, Atka, Aleutian Islands, July 26, 1907, *Van Dyke 243* (G); meadows at east end of Grantley Harbor, vicinity of Port Clarence, July 30, 1901, *Walpole 1602* (US); prostrate on gravel, often along road, Seward, Aug. 5, 1934, *Went 279* (UCal); near Tyoneck, 1907, *Woolsey 35* (US); Arakamtchetchene Island, Behring Straits, 1853-56, *Wright* (NY).

BRITISH COLUMBIA: Nutka, 1791, *Haenke e.2370* (P).

Mertensia maritima is the most unusual species of the North American members of the genus, by reason of the peculiar fruit. It has been maintained by some authors as distinct from *Mertensia* and given generic rank as *Pneumaria.* Dr. I. M. Johnston, prolific and careful student of the borages, was of the opinion (Contr. Gray Herb. N.S. No. 73: 67. 1924) that its recognition as a genus would set generic values too low. The author has found no reason to recognize it as a separate genus and believes that it should be considered to be a *Mertensia.* Although the species is often subject to reduction in size, proceeding from south to north in its range, it presents little difficulty taxonomically when compared to other species of the genus.

2. Mertensia bella Piper in Proc. Biol. Soc. Wash. **31**: 76. 1918.

M. siskiyouensis Applegate in Contr. Dudley Herb. **1**: 154. 1930.

Roots cormose, 2 cm. or less in diameter, bearing many small fibrous roots; stems erect, 1–4 dm. tall, pubescent above, glabrous below; basal leaves reduced to scarious, sheathing phyllodes; lowest stem-leaves broadly ovate or slightly subcordate, 1–5 cm. long, 0.5–3 cm. broad, on narrowly winged petioles about as long as the blade; middle cauline leaves largest, ovate, obtuse or acute, glabrous below or nearly so, strigillose above, 3–7 cm. long, 1.5–5 cm. broad, distinctly 3–6 parallel-veined, petiole shorter than the blade; upper leaves ovate-lanceolate to lanceolate, the uppermost leaves smallest, occasionally bract-like, 1–5 cm. long, 0.5–3 cm. broad, often strigillose below as well as above, sessile or nearly so, opposite; pedicels 0.3–1 cm. long, slender, strigillose; inflorescence borne on long stipes from the axil of the leaves which they surpass, at least at maturity, flowers laxly to densely scorpioid or apparently umbellate; corolla blue, campanulate, 5–10 mm. long, not divided into tube and limb, the lobes about 2 mm. long, obtuse, fornices reduced to a slight thickening in the corolla tissue just above and alternate with the point of insertion of the filaments; anthers 1.2 mm. long, oval; filaments very slender, not expanded, free portion about 1.5 mm. long, inserted about 1 mm. above the base of the corolla; style 4–5 mm. long, reaching or exceeding the anthers; calyx-lobes 1.5–3 mm. long, linear-lanceolate, acute or obtuse, densely strigillose on both sides; nutlets about 1.5 mm. long, slightly rugose-rough-

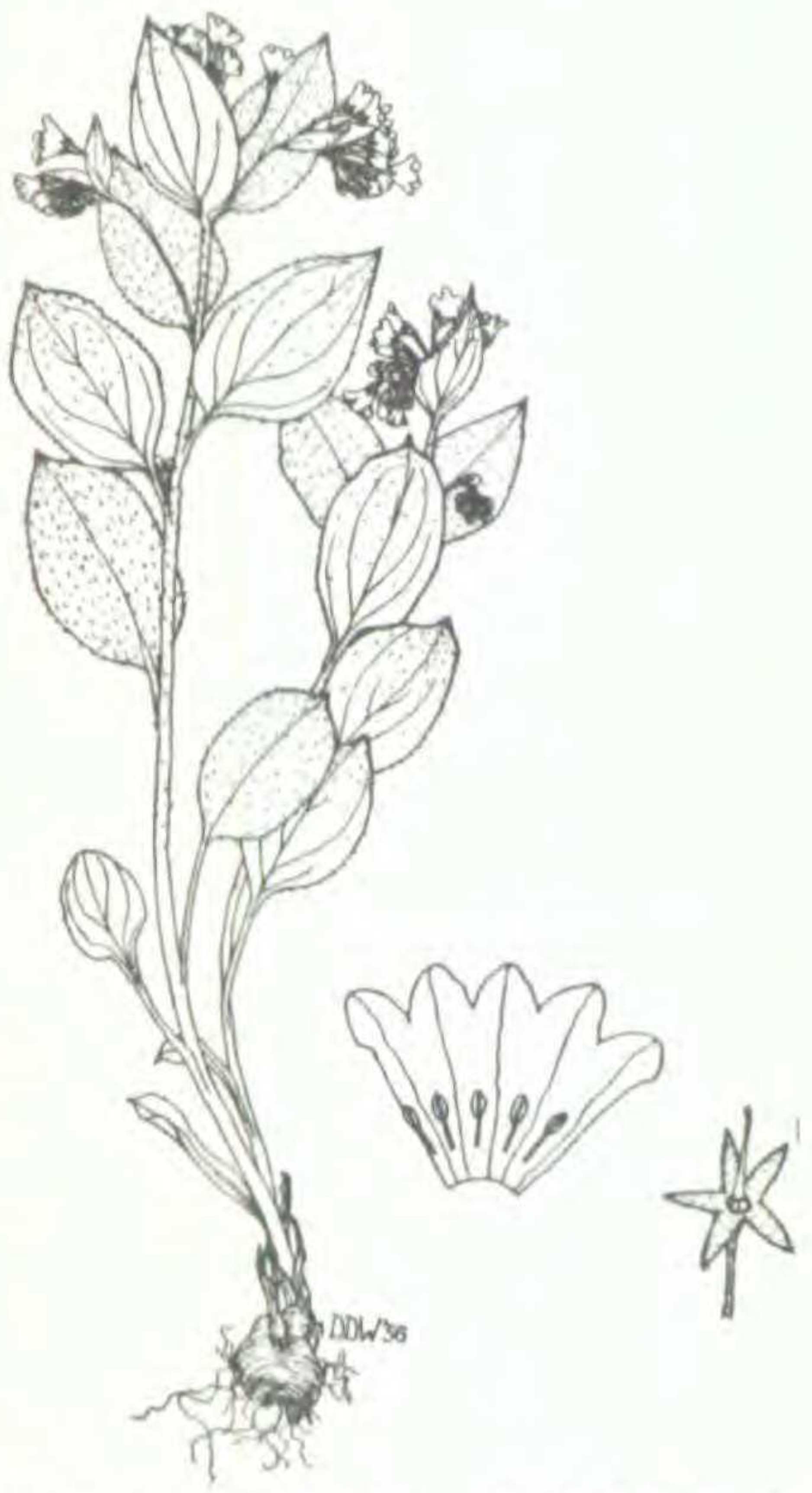

Fig. 2. *M. bella.* Habit sketch × ⅓; enlarged flower × 1⅔.

ened dorsally, scar small, about 0.25 mm. long, near base; intrusion of gynobase high.

Distribution: west-central and southwestern Oregon.

OREGON: Horse Pasture Trail, Horse Pasture Mountain, Lane Co., June 11, 1934, *Andrews 339* (Ore); easterly slope of Grayback Mountain, Siskiyou Mountains, Applegate River watershed, Josephine Co., June 13, 1927, *Applegate 5061* (Dudley Herb. TYPE *M. siskiyouensis*, G); north slope of Grayback Mountain, headwaters of Grayback Creek, Siskiyou Mountains, alt. about 6500 ft., Josephine Co., July 17, 1933, *Applegate 8751* (UCal, F, G); north slope of Mt. Grayback, headwaters of Grayback Creek, alt. about 6500 ft., Josephine Co., July 17, 1933, *Applegate 8767* (Willm, F, G); wet margins of streams in coniferous forests, Oregon Caves National Monument, Josephine Co., June 20, 1935, *Applegate 9696* (W); near Oregon Caves, Josephine Co., May 28, 1928, *Leach* (Willm); along a ravine in open Douglas fir woods on Lake Mountain about 1.5 miles above Oregon Caves, Josephine Co., May 28, 1923, *Leach & Leach 1507* (G); Horse Pasture Mountain, 10 miles southwest of McKenzie Bridge, Lane Co., July 2, 1914, *Peck 5811* (P TYPE); moist slopes 1 mile south of Oregon Caves, July 15, 1918, *Peck 8253* (Willm, G); damp thickets along Cave Lake, 4 miles southeast of Oregon Caves, July 16, 1918, *Peck 8343* (Willm); moist slope, Whiskey Peak, Jackson Co., June 18, 1931, *Peck 16462* (Willm); alpine meadows above Oregon Caves, Siskiyou Mountains, alt. 5000 ft., Josephine Co., July 31, 1935, *Thompson 12441* (G, CAS).

A most striking species which in aspect is much like *Trigonotis*. The characters of the corolla resemble those of *M. maritima* more than any of the true Mertensias. The cormose root, which has its nearest approach in *M. longiflora,* and the opposite upper leaves, as well as the type of inflorescence, are distinctive.

3. **Mertensia Eastwoodiae** Macbr. in Contr. Gray Herb. N.S. No. 49: 18. 1917.

M. alaskana Eastw. in Bot. Gaz. **33**: 287. 1902, non Britt., 1901.

Stems erect, 2–6 dm. tall, one to several from each fleshy root; basal leaves not seen; cauline leaves lanceolate to elliptic, 2–10 cm. long, 1–3 cm. broad, acuminate, usually sessile or the lowermost short-petiolate, both sides strigose, the hairs pointing toward the apex of the leaf, rarely the upper surface almost glabrous, the conspicuous lateral veins tending to converge at the apex of the leaf; pedicels 2–10 mm. long, strigose; inflorescence an ebracteate, modified scorpioid cyme, elongating with age; corolla blue, the tube 5–6 mm. long, usually sparsely pubescent within, the moderately expanded limb 6–7 mm. long (rarely up to 10 mm.); fornices conspicuous, glabrous; anthers 2–2.5 mm. long; filaments about as long as the anthers or slightly shorter; style usually slightly shorter than the corolla or exceeding it; calyx 2–6 mm. long (mostly about 4–5 mm.), the lobes 0.5–1 mm. shorter than the entire calyx, lanceolate to linear-lanceolate, acute, glabrous on the back, ciliate on the margins; nutlets 3–5 mm. long, weakly spinose-rugose on the backs and to a less extent on the sides.

Distribution: Alaska.

ALASKA: Nome, marshy tundra, July 11, 1927, *Ames 41* (F); Nome, 1900, *Blaisdell 94(139)* (UCal); Cape Nome, summer of 1900, *Blaisdell* (CAS TYPE, M, NY, US); without locality, *Bryant* (UCal); Seward Peninsula, near coast on west side of Golofin's Bay, July 1, 1900, *Collier* (US); in shade of alder, grassy places 5 miles north of Nome City, July 8, 1900, *Flett 1536* (US); Lake Iliamna region, on sandy shore at foot of Lake Clark, July 22, 1902, *Gorman 170* (US); foot of hillsides, Nome, June 10, 1914, *Hill 10* (P, US); on Anvil Ridge, Nome, June 23, 1929, *Miller 114-c* (US); Kokrinus, 1925, *Palmer 1599* (US); Nome, coll. of 1916, *Thornton 27* (US); Copper Gulch, Nome, July 17, 1917, *Thornton 136* (US); without locality, coll. of 1901, *Walpole 1614, 1954* (US).

Mertensia Eastwoodiae is more closely related to *M. rivularis* (Turcz.) A. DC., apparently so common on the other side of the Behring Sea, than it is to *M. paniculata*. *Mertensia rivularis* has a smaller flower with a comparatively more expanded limb. The anthers are smaller than in our species. The fruit of *M. rivularis* shows the same markings as our species. The type of pubescence on the leaves is the same and the lateral veins are similar.

There is a possibility that *Lithospermum denticulatum* Lehm. may apply to the plant here called *M. Eastwoodiae* but the exact application of that name remains in doubt. The type could not be located.

4. **Mertensia paniculata** (Ait.) G. Don, Gen. Hist. **4**: 318. 1838.

M. membranacea Rydb. in Bull. Torr. Bot. Club **28**: 33. 1901.

M. paniculata var. *longisepala* Macbr. in Contr. Gray Herb. N.S. No. 48: 6. 1916.

M. Palmeri Nels. & Macbr.[1] in Bot. Gaz. **62**: 146. 1916.

Pulmonaria paniculata Ait.,[2] Hort. Kew. **1**: 181. 1789, including α *floribus caeruleis,* and β *floribus albis.*

Pulmonaria elegans Hort. ex Roem. & Schult., Syst. **4**: 745. 1819.

Lithospermum paniculatum Lehm., Asperif. pars 2: 289. 1818.

Casselia paniculata Dumort., Com. Bot. 22. 1822.

Platynema paniculata Schrad., Ind. Sem. Hort. Götting. 1835, fide Index Kewensis; cf. Linnaea **11**: 89. 1837.

Cerinthodes paniculatum O. Kuntze, Rev. Gen. Pl. pt. 2: 436. 1891.

Stems erect, 1–7.5 dm. tall, one to several from each root; basal leaves 5–20 cm. long, 2.5–14 cm. broad, elliptic-lanceolate to ovate-subcordate, acute to acuminate, the upper surface scabrous with short appressed hairs, the lower surface with rough spreading hairs, the petiole 10–25 cm. long; cauline leaves 5–18 cm. long, 1–8 cm. broad, ovate-acuminate to lanceolate-acuminate, short-petiolate or sessile, pubescence as of basal leaves, all leaves pinnately veined; inflorescence a modified scorpioid cyme, congested at first, elongating with age; peduncles 1–30 mm. long, strigose or with spreading hairs, usually reflexed in fruit; corolla blue, occasionally white, often pinkish when young, the tube shorter than the moderately to much-expanded limb; corolla-tube 4.5–7 mm. long (mostly 5–6 mm.), pubescent or glabrous within; corolla-limb 6–9 mm.

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[1] This is supposed to have been collected in Arizona. It is identical with material of the species coming from British Columbia. It is no doubt a case of mislabel or transferred label, as this particular phase of the species is not known south of the international boundary. See footnote on page 62.

[2] The authority for this species should probably be Solander instead of Aiton. There is little doubt that the name is the work of Solander and not of Aiton, as pointed out by Britten, Jour. Bot. N.S. **11**: 108. 1882. However, Solander's name does not appear in connection with the work and, as indicated by Gray, Jour. Bot. N.S. **11**: 173–174. 1882, "there seems no proper ground for recognizing this in citations."

There is a specimen in the Gray Herbarium, derived from the British Museum of Natural History and collected by Thomas Hutchins in 1773 at Hudson's Bay, which bears the annotation "Pulmonaria paniculata, Sol. Msc." This specimen is here designated as typical.

long (mostly about 7 mm.); fornices conspicuous, glabrous or very rarely with a few hairs; anthers 2.2–3.3 mm. long (mostly about 3 mm.), usually the base higher than the fornices; filaments 1.5–3 mm. long (mostly 2–3 mm.); style about as long as or slightly exceeding the corolla, exceeding the anthers; calyx 2–7 mm. long (mostly about 4 mm.), hairy or glabrous, the lobes about 1 mm. shorter than the entire calyx, strigose with spreading hairs on the back, or glabrous, ciliate, narrowly lanceolate to triangular, acute; nutlets rugose on all sides as well as minutely papillate, falling as soon as mature or possibly just before maturity.

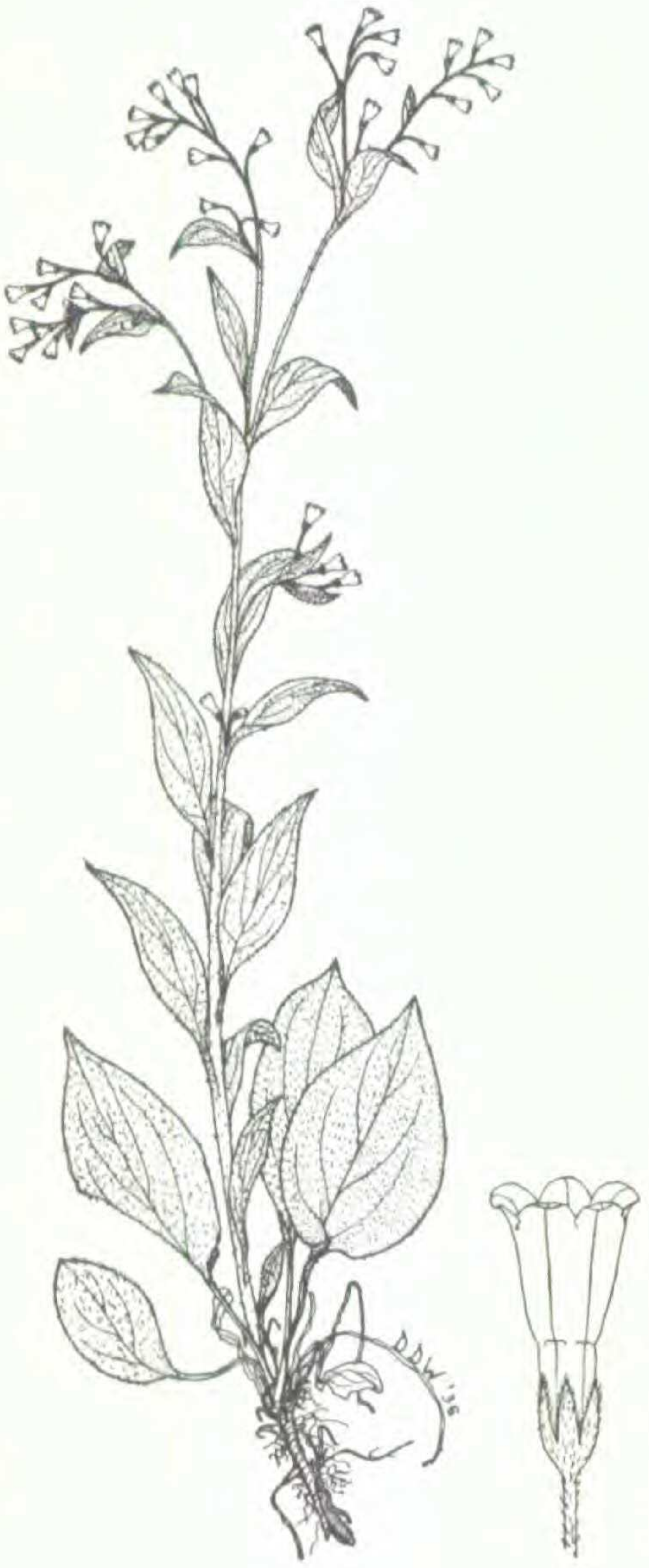

Fig. 3. *M. paniculata.* Habit sketch × 1/6; enlarged flower × 1⅔.

Distribution: eastern Quebec, Ontario, Michigan, Wisconsin, Minnesota, and Iowa, thence across Canada to British Columbia and north through Alaska. Montana, Idaho, and Washington.

Quebec: clay river bank, Rupert House, east coast James Bay, July 8, 1929, *Potter 686* (G); soggy woods, East Main, east coast James Bay, July 11, 1929, *Potter 689* (G); gravel beach, Brushy Island, east coast James Bay, July 12, 1929, *Potter 694* (G); Amos (Abitibi), July 10, 1918, *Victorin 8376* (NY, G, US, M).

Ontario: rich soil, north shore of Lake Superior, June, 1890, *Aiton* (F); Moose River Basin, coll. of 1903, *Bell* (G); Hudson's Bay, *Burke* (G, NY); Hudson's Bay, coll. of 1773, *Hutchins* (G designated as TYPE); L. Superior, coll. of 1869, *Macoun 73* (US); Nipigon, north shore of Lake Superior, Sept. 12, 1896, *Miller* (G); in thin mold on mossy rock, Township of Deloro, Porcupine Mining District, June–July, 1911, *Nichols 8, 14, 26, 62* (F); bank by Algoma Central R. R., Tatnall Station, near Oba Lake, June 23, 1921, *Pease 17944* (G); clearing, Hearst, June 23, 1921, *Pease 18032* (G); damp grassy or shaded places, Jack Fish, Thunder Bay District, July 5, 1933, *Pease & Bean 23472* (G); clay river bank, Saw Pit Island, Moose River, James Bay, July 1, 1929, *Potter 680* (G); wooded bank along Blacksmith Rapids, Abitibi River, James Bay, June 29, 1929, *Potter 687* (G); Gravel Island, near mouth of Nipigon River, coll. of 1912, *Pulling* (G); clay soil, Onoman River, Thunder Bay Dist., coll. of 1912, *Pulling* (G); Howard Fall, near L. Nipigon, coll. of 1912, *Pulling* (G); banks of Kaministikwa River, Fort William, July 25, 1912, *Williamson 1788* (ANS); north shore of Lake Superior, July, 1897, *Van Brunt & Van Brunt 170* (NY).

MICHIGAN: near Houghton, June 12, 1883, *Britton* (ANS); Phoenix and Lac LaBelle, Keweenaw Co., July 8, 1888, *Farwell 282* (G); Phoenix, June 1885, *Farwell 2111* (ANS); brook side in woods south of L'Anse, Baraga Co., July 3, 1934, *Fernald & Pease 3493* (G); open woods, June, 1884, *Wood* (US, AM); 1885, *Wood* (Ariz).

WISCONSIN: Siskiwit Bay, June 26, 1897, *Cheney 6516* (G); moist grounds at the Central Mine, L. S., coll. of 1863, *Robbins 146* (G); Solon Springs, June 30, 1915, *Stone* (ANS); south shore Lake Superior, coll. of 1849, *Whitney* (G).

MINNESOTA: moist soil, Two Harbors, June, 1896, *Aiton* (NY); Duluth, July 4, 1935, *Baehni 668* (F); Duluth and vicinity, June 10–12, 1911, *Rydberg 8310* (NY); rich soil, Two Harbors, June 1890, *Sandberg* (F, G, US, M, ANS, Ariz, NY); moist places, Two Harbors, June 1891, *Sandberg* (NY, Ry, N); Two Harbors, May 1891, *Sandberg 104* (P, N); Two Harbors, Lake Co., June 1893, *Sheldon* (Ry, G, US, P); July, 1889, *Wood* (US); Fond du Lac, June 1891, *Wood* (Ariz, Cl, US, K, Ry).

IOWA: Decorah, June 1882, *Holway* (NY, US); Decorah, June 10, 1882, *Holway* (F); Decorah, June 13, 1887, *Holway* (F, M).

MANITOBA: Winnipeg Valley, coll. of 1859, *Bourgeau* (G); The Pas, route of Hudson Bay Railway, July 1, 1917, *Emerton* (G); Kettle Rapids, route of Hudson Bay Railway, July 15, 1917, *Emerton* (G); low woods, Observation Pt., Lake Winnipeg, July 22, 1884, *Macoun* (ANS).

MACKENZIE DISTRICT: Mackenzie River, coll. of 1861–62, *Onion, Kennicott & Hardesty* (NY); Hay River, June 30, 1903, *Preble & Cary 24* (US).

SASKATCHEWAN: coll. of 1858, *Bourgeau* (G); near Prince Albert, July 1896, *Macoun 14132* (F).

ALBERTA: wet woods near Bow River, *Barber 198* (G); Clive, coll. of 1918, *Bickle* (CAS); small draw in brush clearing, Red Deer River, Content, Stettler District, June 20, 1926, *Brinkman 2214* (US); low spot in forest, Highwood River Forest Stn., Highwood River District, June 6, 1928, *Brinkman 3139* (Cl, NY); Choba Lake, headwaters of the Saskatchewan and Athabasca Rivers, July 8, 1908, *Brown 1174* (ANS); Red Deer, Alta, 1910, *George 863* (P); Sarceo Reserve, June 15–Aug. 15, 1905, *Goddard 448* (UCal); Athabasca Landing, July 28, 1914, *Hitchcock 12075, 12097* (US); Prairie Creek, July 3, 1911, *Hollister 69* (US); near Banff, July 14, 1891, *Macoun* (G); moist ground, wooded hills and thickets, Shaganappi, vicinity of Calgary, alt. 3400–3600 ft., June 21, 1913, *Moodie 4* (NY, US, F); coal woods, Elbow River Valley, vicinity of Calgary, alt. 3400–3600 ft., July 7, 1915, *Moodie 1053* (G, US, NY, Clokey, F); in woody swamp near Athabasca River, June 23, 1927, *Ostheimer 10B* (G); foothill of Banff, July, 1893, *Schaffer* (ANS); on the Miette, headwaters of the Saskatchewan and Athabasca Rivers, Aug. 12, 1908, *Schaffer 1568* (ANS).

MONTANA: moist stream bank, Fish Creek near mouth of Cache Creek, Mineral Co., alt. 3500 ft., July 11, 1933, *Hitchcock 1761* (UM, CAS, G); creek bottoms, woods, Lolo Valley, alt. 3600 ft., July 16, 1921, *Kirkwood 1258* (G, M, UM); Lolo Creek Canyon, Aug. 19, 1880, *Watson 290* (G).

"ARIZONA": coll. of 1869, *Palmer 2* (US, TYPE of *M. Palmeri).*

IDAHO: Boulder Creek, Shoshone Co., July, 1900, *Abrams 804* (NY); Boville, June 17, 1911, *Beattie 4104* (P); Collins, June 17, 1911, *Beattie 4131* (P); near Lake Chatcolet, June 23, 1929, *Colvin* (UIdaho); along streams on shaded banks, Cedar Mountains, May 1897, *Elmer 793* (P, M, NY, US, Ry); Cedar Mountain, near Moscow, Latah Co., June 17, 1892, *Heller 420* (ANS); moist, sunny brook sides, Mt. Moscow, July 7, 1894, *Henderson 2813* (G, Cl, US); moist woods, along Alder Creek, Benewah Co., June 19, 1927, *Jones 727* (ANS, P); Moscow Mountain, Latah Co., May 22, 1926, *Jones 1673* (G); Indian Grave Camp, Clearwater Forest, alt. 6000 ft., Aug. 26, 1924, *Kirkwood 2005* (Ry); Kootenai Co., July, 1886, *Leiberg* (F); forks of St. Mary's River, Shoshone Co., alt. 950 m., July 1, 1895, *Leiberg 1136* (UCal, US, F, M, Ry, G, NY); Moscow, May 18, 1906, *Lewis* (UIdaho); MacAbee's Ranch, Priest River Valley, alt. 600 m., July 23, 1900, *MacDougal 3* (NY TYPE *M. membranacea*, P photo, G photo); Cedar Mountains, Latah Co., June 17, 1892, *MacDougal 428* (F); moist shady woods along Paradise Creek, Thatuna Hills, May 31, 1913, *Muenscher 352* (Cl); moist woodland, Grizzly Camp, on Palouse River, Latah Co., July 2, 1922, *Parker 493* (P); dense woodland, north side Cedar Mountains, Latah Co., July 4, 1922, *Parker 683* (P); Cedar Mountains, Latah Co., July 7, 1893, *Piper 1691* (P); grassy and brushy river flat, one-fourth mile north of Clarkia railroad station, St. Maries River, St. Joe National Forest, July 19, 1933, *Quick 1157* (UCal); along shady banks of streams, Hayden Creek, Coeur d' Alene, Aug. 1, 1912, *Rust 155* (US); moist places, Kootenai Co., May, 1862, *Sandberg* (P); along streams, Kootenai Co., June, 1892, *Sandberg* (UCal); moist places, Latah Co., June 1892, *Sandberg* (P, NY); moist places, Cedar Mountain, Latah Co., alt. 1050 m., June 17, 1892, *Sandberg, MacDougal & Heller 420* (G, US, NY, CAS); on wet shady creek bank near Zaza in the Craig Mountains, Nez Perce Co., alt. 4800 ft., Oct. 9, 1927, *St. John 9087* (P); Cedar Mountain, June–July, 1914, *Weaver* (N); deep moist woods, Sanders, Benewah Co., June 22, 1927, *Weitman 337* (P).

ALASKA: Matanuska, July 4, 1931, *Anderson 797* (US); Fairbanks, July 10, 1922, *Anderson 1892a* (NY); Ft. St. Michaels, Norton Sound, coll. of 1865-66, *Bannister* (Cl, G, US, F); mouth of the Tananah River, coll. of 1881, *Bates* (ND TYPE of *M. strigosa*, UCal); along the Delta River, June, 1907, *Black 17, 36* (US); grassy hillside in gravelly soil, St. Michaels, June 25, 1902, *Brooks* (G); between Tyonok, on Cook Inlet, and Rampart City, Yukon River, June 1, 1902, *Brooks & Pringle* (US); Mission Premises, Anvik, June, July, and Aug. 16, 1905, *Chapman 6* (G); Anvik, near the Mission, July 8, 1924, *Chapman 69* (NY); along Ninklink River, Seward Peninsula, July, 1900, *Collier* (US); near Council City, July 24, 1902, *Coulter* (F); springy slopes, Bennet, July 30, 1907, *Cowles 985* (US, M, F); Kaminsichtuh River, May 30, 1867, *Dall* (F); Savage River, Mt. McKinley District, June 17, 1926, *Dickson* (UCal); McKinley Park Station, Mount McKinley National Park, June 4, 1932, *Dixon 11* (US, UCal); Igloo Creek, Mt. McKinley National Park, June 13, 1932, *Dixon 24* (US, CAS, UCal); White River Valley, near the boundary, coll. of 1909, *Eaton* (US); Chitina Valley, north of Mt. St. Elias, coll. of 1913, *Eaton* (US); Tyoonock, July 31, 1897, *Evans 476* (US); near old cannery on high ground, Kussiloff, July 1898, *Evans 737* (US); Johnson River, between Cook Inlet and the Tanana River, June 27, 1899, *Glenn* (US); damp open woods, foot of Lake Lebarge, June 7, 1916, *Harrington 13* (US); Holy Cross, July 24, 1917, *Harrington 72* (US); swamp near Tunulik River, Goodnews Bay, July 16, 1919, *Harrington 74* (US); open places, on high banks, common throughout the Yukon and Tanana Valley, Ft. Gibbon, July 4, 1905, *Heideman 51* (US); vicinity of Copper Center, 1908, *Heideman 74* (US); Koyukuk, June, 1905, *Hilsman* (US); vicinity of Unalakleet, Norton Sound, Aug. 18, 1920, *Johnston & Palmer 24* (NY, US); very common, Rampart, June 16, 1901, *Jones 25* (US); St. Michaels, Aug., 1915, *Kusche* (CAS); Nushagak, June 25, 1881, *McKay* (US); abundant, in birch woods, Dall River, 35 miles above mouth, June 21, 1901, *Mendenhall* (US); between Yukon River, Nation River, and International Boundary, coll. of 1930, *Mertie 99* (US); open spaces in spruce forest, flat north of Savage River, alt. 900 m., July 5, 1928, *Mexia 2079* (ANS, M, G, US, NY, UCal, CAS); Jennie Creek, McKinley Park, July 10, 1922, *Murie* (US); McDonald Creek, Salcha Slough, June 20, 1922, *Murie* (US); very common in open woods where no moss covers the ground, Kenai, June 9, 1901, *Nielsen 14* (US); on mountain side, head of Seward Creek, near Eagle, alt. 5000–6000 ft., Aug. 8, 1903, *Osgood* (US); Kuskokwin River, July 22, 1922, *Palmer 400* (US); Fairbanks, *Patton* (UCal); Dall River, June, 1904, *Piper* (US); opposite Fort Hamlin, June 23, 1904, *Piper* (US); Kenai, Aug. 18–20, 1904, *Piper 4440* (US); St. Michaels, July 10, 1889, *Russell* (US); on the banks of the Yukon and Porcupine Rivers, near Fort Yukon, Aug. 8–12, 1889, *Russell* (US); headwaters of the Copper and Tanana Rivers, Batzulnetas Village, June 19, 1902, *Schrader & Hartman 3* (US); St. Michael, June 30, 1899, *Setchell* (UCal); swampy country, Talushulitna Valley, July 1, 1903, *Shainwald* (NY); luxuriantly green slope, headwaters of Chulitna River, alt. 2500 ft., Sept. 11, 1903, *Shainwald* (NY, ANS); valley of Putnam River, July 1, 1885, *Stoney* (US); Camp Retreat, June 28, 1886, *Stoney* (US); on the Porcupine River, coll. of 1891, *Turner* (UCal); 1884, *Weinmann* (US); Fort Gibbon, coll, of 1899–1901, *Weirick* (US); Alaska range near Paxon's July–Aug. 1934, *Went* (UCal); near Tyoneck, 1907, *Woolsey 2* (US).

YUKON: Labarge, summer of 1932, *Bayne Beauchamp Expedition 110* (UCal); Dominion Creek, 1900, *Bolton* (US); on island 20 miles below Dawson, June 16, 1902, *Collier 10* (US); Carcross, July 16, 1914, *Eastwood* (CAS, G); 24-mile House, Dawson, June 25, 1914, *Eastwood* (CAS); common, Dawson, June 3, 1914, *Eastwood 137* (G, NY, Clokey, US, UCal, F, CAS); White Pass, July 23, 1914, *Eastwood 903* (CAS); Ladue Valley, Alaska-Canada Boundary, June 15–Aug. 15, 1910, *Eaton* (US); dry gravelly soil, open woods, Fort Selkirk, May 31, 1899, *Gorman 999* (US); moist meadows, Ranch Valley, July 5, 1899, *Gorman 1076* (NY, US); Fort Selkirk, June 14, 1903, *Hollick* (NY); woods and meadows, Dawson, alt. 1500 ft., June 16, 1933, *Hutchinson 2, 4* (G, UCal); King Point, June 24, 1906, *Lindstrom* (NY); Mosquito Gulch, coll. of 1898–1901, *MacLean* (UCal); Little Dawson River, coll. of 1898–1901, *MacLean* (UCal); Lake Bennett, July 8, 1902, *Macoun 78739* (UCal); hillsides at Hunkes Creek, July 31, 1902, *Macoun 78741* (UCal); Moosehead Mountain, Dawson, alt. 2300 ft., July 14, 1902, *Macoun 78742* (UCal); flats above Rink Rapids, Yukon River, July 9, 1902, *Macoun 78743* (UCal); Colorado Creek, July 28, 1902, *Macoun 78744* (UCal); Bear Creek (near Lake Desert D'Asch), Aug. 6, 1920, *Muller* (ANS, G, US); Lake Kulane to Don Jek River, Aug. 11–27, 1920, *Muller* (US, ANS, G); Lake Linderman, Upper Yukon, June 12, 1883, *Schwatka 13, 42* (G); Lake Bennett, Upper Yukon River, June 10, 1883, *Schwatka 57* (G); Upper Yukon River above Fort Selkirk, July 12, 1883, *Schwatka 95* (G);

Five Finger Rapids, July 5, 1899, *Tarleton 77* (NY, US); Labarge, June 15, 1898, *Williams* (NY).

British Columbia: Bennett, Aug. 5, 1917, *Anderson 1112* (NY); Fort George, Yale & Caribou Districts, Aug. 9, 1918, *Anderson 799* (P); Atlin, Lake Atlin, July 14, 1914, *Eastwood* (CAS, G, US); west of Prince George, June 4, 1935, *Murie 1317* (M, W); in gulley, in shade of willow thickets, 150 Mile House, Caribou Road, June 28, 1935, *Murie 1318* (M, Willm, W); mountains near head Iskut River, Cassiar District, July 30, 1910, *Preble & Mixter 622* (US); in poplar thicket along creek, vicinity of Dawson Creek, June 8, 1932, *Raup & Abbe 3511* (G); poplar woods, south slopes of Peace River Valley, vicinity of Hudson Hope, June 21, 1932, *Raup & Abbe 3633* (F, NY, G); rich woods along Wicked River, near the Peace River, July 18, 1932, *Raup & Abbe 3871* (NY, G); above timber line, west and northwest slopes of Mt. Selwyn, July 19, 1932, *Raup & Abbe 3940* (G); dry ground, Lake Tatleb, July–Aug., coll. of 1865–66, *Rothrock 52* (Cl, G, F); Glacier, Aug. 1895, *Schaffer* (ANS); Atlin, July 9, 1930, *Setchell & Parks* (UCal); Mt. Atlin, Aug. 15, 1929, *Swarth 180* (CAS); Burgess Pass, July 16, 1919, *Walcott* (US); Telegraph Creek, June 1918, *Walker 1186* (CAS, Ry, M, Cl, US, G).

Washington: stream bank in deep woods, Mt. Spokane, Spokane Co., alt. 5200 ft., June 22, 1935, *Clarke* (W); in thickets along banks of Omak Creek above Disautel, east of Omak, June 19, 1932, *Fiker 862* (NY, P, M); along stream, Blue Mountains, Asotin Co., May 24, 1930, *Jones 2869* (G); Mt. Carlton, Spokane Co., July 16, 1902, *Kreager 190* (US, G, P, Clokey, NY); Davis Ranch, July 18, *Kreager 202* (P, US); Davis Ranch, July 18, 1902, *Kreager 216* (P); in woods in moist places, east of Usk, Pend Oreille Co., May 16, 1923, *Lackey* (P); in damp woods on Mt. Spokane road 12 miles northeast of Mead, Spokane Co., July 16, 1923, *Lackey* (P); shady, wet ground, slopes of Mt. Spokane, alt. 3500 ft., June 20, 1932, *Milburge 499* (G); wet bottom, Old Mill, Asotin Co., June 26, 1927, *Onstot* (P); 7 miles northeast of Wellpinit, Stevens Co., June 13, 1923, *Spiegelberg 526* (P); along creek, 5 miles north of Chewelah, Stevens Co., June 6, 1923, *Sprague 702* (P); Hangman (Latah) Creek, Spokane Co., May 20, 1889, *Suksdorf* (P); Rock Creek, near Mica Peak, June 5, 1889, *Suksdorf* (P); Newman Lake, Spokane Co., July 9, 1916, *Suksdorf 8801* (P, W); base of talus slope, south of Republic, toward Keller, June 29, 1931, *Thompson 7158* (G, UCal, US, NY, M); Newman Lake, Spokane Co., June 8, 1913, *Turesson* (Ry).

Locality Lacking: "herb. Lehm. sub. nom. Lithospermum paniculatum, Pulmonaria, Hffl. collect." (ANS); Arctic America, *Richardson* (ANS).

4a. **Mertensia paniculata** var. **alaskana** (Britt.), comb. nov.

M. alaskana Britt. in Bull. N. Y. Bot. Gard. **2**: 181. 1901.

Leaves linear to narrowly elliptical, strigose above, glabrous to sparsely spreading pubescent below; the calyx-lobes glabrous on the back, otherwise as the species.

Distribution: Alaska and the Yukon.

Alaska: Sheenjek Valley, coll. of 1926, *Mertie* (US); valley of Chandalar River, June 10–July 4, 1927, *Mertie* (F); valley of Chandalar River, alt. 800–2000 ft., June 10–July 4, 1927, *Mertie 35* (US); Fort Yukon, June 9, 1926, *Murie* (CAS);

Fort Yukon, June 21, 1899, *Shrader* (US); Fort Yukon, coll. of 1865, *Soule* (NY TYPE, F).

YUKON: Dawson Slide, June 16, 1914, *Eastwood* (CAS); Coffee Creek, July 9, 1914, *Eastwood* (CAS); Dawson Slide, May 23, 1914, *Eastwood 94* (Clokey, UCal, F, NY, G, US, CAS); Forty Mile Creek, Yukon River, May 31, 1893, *Funston 53* (US, NY, G); between the boundary and Forty Mile Creek, May 27, 1890, *McGrath* (US); between the boundary and Forty Mile Creek, Yukon River, June 5, 1890, *McGrath* (US); Dawson, June 6, 1899, *Williams* (NY).

''SUBARCTIC AMERICA'': ''Exploration in subarctic America, 1861–62,'' *Onion, Kennicott & Hardisty* (NY).

4b. **Mertensia paniculata** var. **borealis** (Macbr.), comb. nov.

M. laevigata Piper in Contr. U. S. Nat. Herb. [Fl. Wash.] **11**: 477. 1906; Macbr. in Contr. Gray Herb. N.S. No. 48: 10. 1916.
M. pratensis var. *borealis* Macbr., *l.c.* 8.
M. brachycalyx Piper, *l.c.*
M. leptophylla Piper, *l.c.* 478.
M. paniculata var. *subcordata* f. *leptophylla* Macbr. *l.c.* 7.
M. laevigata var. *brachycalyx* Macbr., *l.c.* 10.
M. paniculata var. *laevigata* G. N. Jones in Univ. Wash. Publ. Biol. **5**: 219. 1936.

This variety differs from the species in having the leaves glabrous on both sides or pubescent below, or minutely strigillose above.

Distribution: northern Idaho, adjacent Montana, southern British Columbia, Washington, and Oregon.

MONTANA: small pocket, near summit of east side of Continental Divide, between Irish and Cache Creeks, Lolo National Forest, Mineral Co., Aug. 13, 1933, *Hitchcock 2109* (G); springy place, canyon west of St. Regis, Missoula Co., alt. 4000 ft., July 22, 1921, *Wiegand 2081* (Cl).

IDAHO: northeast ridge, Cedar Mountain, Latah Co., July 2, 1911, *Beattie 4304* (P); Three Devils Creek at Middle Fork Clearwater River, 4 miles below Lowell, Clearwater National Forest, Idaho Co., June 2, 1935, *Constance, Dimond, Rollins & Worley 1105* (W); Priest River Exp. Station, alt. 2700 ft., July, 1923, *Epling 6002* (F, M); Upper Priest River, alt. 3000 ft., July 15, 1925, *Epling 7308* (M); Hughes meadow, Upper Priest River, alt. 3000 ft., July 15, 1925, *Epling 7391* (F, M) and *7396* (M); rich bottom, Upper Priest River, alt. 3000 ft., July 20, 1925, *Epling 7494* (M); Orogrande Creek, alt. 3000–4000 ft., July 12, 1926, *Epling & Hauch* [*Houck*] *9355* (M, US); Fish Lake Creek, alt. 5000 ft., July 20, 1926, *Epling & Hauch* [*Houck*] *9496* (US, M); Fish Lake, alt. 5600–6800 ft., July 21, 1926, *Epling & Hauch* [*Houck*] *9541* (M); Fish Lake, alt. 6000 ft., July 21, 1926, *Epling & Hauch* [*Houck*] *9608* (M); near Boise, 1916, *Gageby* (Ry); moist, shaded ravine, near Fish Lake, Clearwater National Forest, alt. 6200 ft., Aug. 15, 1933, *Hitchcock*

2169 (G); Black Lake to Bear (P.O.), Seven Devils Mountains, Adams Co., alt. 4500–8000 ft., July 20, 1931, *Johnston* (CAS); burn near Elk summit, Selway Forest, alt. 6000 ft., Aug. 25, 1923, *Kirkwood 1611* (G); Cyr's cabin on Fish Lake Creek, Clearwater Forest, alt. 5000 ft., Aug. 20, 1924, *Kirkwood 1881* (UM, G); Indian grave camp, Clearwater Forest, alt. about 6000 ft., Aug. 26, 1924, *Kirkwood 2005* (G, UM); on trail from Big Sand Creek to Elk Summit, Selway Forest, alt. 6000 ft., Aug. 26, 1923, *Kirkwood & Severy 1611* (UM); divide between St. Joe and Clearwater River, alt. 1540 m., July 9, 1895, *Leiberg 1217* (Ariz, G TYPE of *M. pratensis* var. *borealis*, M, NY, Ry, UCal, US, F); West Fork of Priest River, alt. 1200 m., Aug. 4, 1897, *Leiberg 2834* (US); rocky soil, Hornet Creek, Weiser Forest, alt. 4000 ft., June 4, 1915, *Mangun 147* (N); Quartzburg, July 24, 1892, *Mulford* (NY, M); Latah Co., July 7, 1893, *Piper 1691* (G); along streams, Kootenai Co., July, 1887, *Sandberg* (UCal); summit of Cedar Mountain, Latah Co., July 5, 1923, *Shaw* (P); Clearwater, *Spalding* (G); Wallace, Shoshone Co., July 10, 1924, *Stillinger 10* (P); Upper Priest River, Boundary Co., July 10, 1924, *Stillinger 12* (P); meadow land, Idaho National Forest, alt. 6000 ft., July 12, 1913, *Varner 2* (Ry); moist soil, Hughes Fork, trail fr. Seine Creek, Boundary Co., Aug. 1, 1924, *Warren 304* (P).

BRITISH COLUMBIA: woods near creek, road between Reno Mill and Kootenay Belle Mine, Salmo, July 15, 1935, *MacFadden 13853* (NY).

WASHINGTON: Narada Falls, Mt. Rainier National Park, July 17–23, 1922, *Abrams 9177* (M, NY, Ry); Mt. Rainier, alt. 7000 ft., July 20, 1892, *Allen 2* (G); Goat Mountains, near the Upper Valley of the Nesqually, July 22, 1896, *Allen 231* (M, P, NY, UCal, G, US TYPE); near Narada Falls, July 29, 1924, *Baker 729b* (CAS); Yakima Region, coll. of 1882, *Brandegee* (UCal); Yakima Region, coll. of 1882, *Brandegee 472* (M); coll. of 1883, *Brandegee 999* (UCal); Scenic Washington, July 1916, *Clegg* (CAS); shade of coniferous woods, Godman Springs, Blue Mountains, Columbia Co., alt. 5740 ft., July 21, 1935, *Constance & Clarke 1280* (W); dry ground in brush, edge of woods, Godman Springs, Blue Mountains, Columbia Co., alt. 5740 ft., July 19, 1935, *Constance, Clarke, Staats & Van Vleet 1166, 1170* (W); Paradise River, Mt. Rainier, July 17, 1907, *Cowles 677* (F); Columbia Co., July, 1913, *Darlington* (P); Alder Spring, Columbia Co., July, 1913, *Darlington 49* (P); Poverty Flat, Columbia Co., Wenaha Forest Reserve, July 16, 1913, *Darlington 383* (P); Chiwawa River basin near Wenatchee River, Wenatchee Forest, Chelan Co., alt. 600 m., July 7, 1916, *Eggleston 12970* (US); Chiwaukum Creek, Wenatchee Forest, Chelan Co., alt. 1150 m., Aug. 18–20, 1916, *Eggleston 13535* (US); Mt. Stuart, Cascades, Aug., 1898, *Elmer 1195* (P, US); Olympic Mountains, Clallam Co., July, 1900, *Elmer 2826* (NY, P, M, US TYPE of *M. leptophylla*); in moist grounds on tributary creeks to the Pend Oreille River, June, 1905, *Fallcott* (M); hills along Klickitat River, June 27, 1899, *Flett 1199* (P); Marysville, *Grant* (M); Cascade Mountains, Aug. 1925, *Grant* (F, CAS); Glacier Basin, alt. 6000 ft., Aug., 1925, *Grant* (ANS, CAS); Rainier National Park, Aug., 1925, *Grant* (Ry); Steven's Pass, foothills Cascade Mountains, June, 1928, *Grant* (Ry); in the forest along Van Trump Creek, on the Van Trump Park trail, Rainier National Park, Aug. 12, 1928, *Heller 14794* (M, US); moist ground, along streams, Cascade Mountains, Aug. 2, 1892, *Henderson 2259* (P, G); Blue Mountains, June 11, 1897, *Horner 367* (US); moist ravines, Blue Mountains, Columbia Co., June 11, 1897, *Horner B367* (G); Simcoe Mountains, June 6, 1879, *Howell*

(US) ; rock slide, Melakwa Lake Trail, King Co., July, 1925, *Jones 189* (P) ; Davenport, Lincoln Co., alt. 2500 ft., May 20, 1905, *Jones* (G) ; Mt. Rainier, July, 1917, *Kelley* (CAS) ; Mt. Rainier, July 1914, *King* (CAS) ; Blue Mountains, July 4, 1892, *Lake & Hull* (M) ; Tukanon River, July 5, 1892, *Lake & Hull 639* (P, NY) ; ''Cob Bob'' Peak, Chehalis Co., alt. 3000 ft., Aug. 4, 1897, *Lamb 1383* (F, P), and *1383a* (NY, M, ANS) ; in path of snow slide, north side of mountain, Lake Crescent, on Mt. Storm King, Clallam Co., alt. 600–4300 ft., July 23, 1904, *Lawrence 359* (P) ; Mt. Adams, Cascade Mountains, Aug. 9, 1894, *Lloyd* (NY) ; Simcoe Mountain, 1860, *Lyall in part* (G) ; Seattle, Aug. 24, 1892, *Mosier* (US) ; along stream in Cascade Mountains, Tye, King Co., Aug. 23, 1913, *Muenscher 1037* (Cl) ; mountain side below Embro, alt. 2300 ft., June 7, 1918, *Otis 699* (CAS) ; Paradise Valley, Aug. 5, 1928, *Parks & Parks 21049* (M, F, UCal, US) ; along streams in woods, Blue Mountains, Walla Walla Co., July 17, 1896, *Piper* (P) ; Olympic Mountains, Sept. 27, 1890, *Piper 919* (G) ; rich meadows, Mt. Rainier, alt. 6500 ft., Aug. 1–15, 1895, *Piper 2116* (P, US) ; Nason City, alt. 6000 ft., July, 1863, *Sandberg & Leiberg* (P) ; Nason Creek, alt. 3500–6000 ft., Aug. 4, 1893, *Sandberg & Leiberg 678* (P, M, ANS, F, UCal, NY, G, CAS, US TYPE of *M. brachycalyx);* Wellington, Snohomish Co., July, 1898, *Savage, Cameron & Lenocker* (M, F) ; moist slopes by trail to Snow Lakes, near Leavenworth, Wenatchee Mountains, alt. 3500 ft., May 28, 1931, *Seely 2* (M) ; Glacier Basin, Mt. Rainier, alt. 5935 ft., Aug. 19, 1919, *Shaw* (P) ; Cowlitz Valley and vicinity of Mt. Rainier, July–Aug., 1911, *Sherman 391* (Cl) ; moist ground, Dalkena, Pend Oreille Co., May 10, 1923, *Spiegelberg 524* (P) ; north side of Pend Oreille River, Dalkena-Newport, Pend Oreille Co., May 11, 1923, *Spiegelberg 525* (P) ; Ranch of Many Waters, Dalkena-Newport, Pend Oreille River, Pend Oreille Co., May 11, 1923, *Sprague 700* (P) ; on mountain creek, three miles south of Pork Rapids, Stevens Co., May 28, 1923, *Sprague 701* (P) ; moist, along creek, 5 miles north of Chewelah, Stevens Co., June 6, 1923, *Sprague 702 in part* (P) ; moist rich soil, Hoverland Meadows, Stevens Co., June 16, 1923, *Sprague 703* (P) ; mountain bog at head of creek, Mt. Calispal, Stevens Co., alt. 4500 ft., June 8, 1923, *Sprague 704* (P) ; Pork Rapids, Stevens Co., May 28, 1923, *Sprague 705* (P) ; moist creek bottom, 6 miles west of Camden, Pend Oreille Co., May 7, 1923, *Sprague 708* (P) ; rocky banks of Canyon Creek, Clallam Co., alt. 3000 ft., Aug. 25, 1921, *St. John 4788* (P) ; rock slide, Bald Mountain, head of Nile Creek, Rainier National Forest, Yakima Co., alt. 6050 ft., July 22, 1923, *St. John 7855* (G, F) ; thicket, base of peridotite slide, 2 miles below Chiwaukum, Chelan Co., May 19, 1928, *St. John, Eggleston, Beals & Warren 9450* (P) ; wet shaded woods, Chiwaukum, Chelan Co., May 19, 1928, *St. John, Eggleston, Beals & Warren 9458* (P) ; creek in woods, Anatone, Asotin Co., alt. 3000 ft., May 30, 1928, *St. John & Palmer 9563* (P, NY) ; mossy edge of creek, Agnes Creek, Chelan Co., July 17, 1923, *St. John & Ridout 3643* (P) ; stream bank, Stayawhile Springs, Columbia Co., alt. 5300 ft., July 6, 1927, *St. John & Smith 8333* (W, P) ; Quartz Valley, Olympic Mountains, Aug. 11, 1913, *Streator 6* (P) ; moist grounds, Mt. Paddo (Adams), alt. 5000–6000 ft., Aug. 10, 1882, *Suksdorf* (UCal, ANS, F, P) ; Mt. Paddo (Adams), July 12, 1886, *Suksdorf* (P) ; Hangman (Latah) Creek, Spangle, Spokane Co., May 20, and June 17, 1889, *Suksdorf* (P) ; Trout Valley, Klickitat Co., June 20, 1890, *Suksdorf* (P) ; Cascade Mountains, Skamania Co., Aug. 26, 1890, *Suksdorf* (P) ; Wodan Valley, Mt. Adams, Skamania Co., Sept. 2, 1891, *Suksdorf* (P) ; Wodan Valley, Mt. Adams, Skamania Co., Sept. 25, 1896, *Suksdorf* (P) ;

"Rolthal"—a small valley a few miles west of Trout Lake, Klickitat Co., Aug. 5, 1899, *Suksdorf* (P, W); among rocks, Mt. Paddo, alt. 2200 m., Aug. 1907, *Suksdorf* (NY); Wodan Valley, Mt. Adams, Skamania Co., Aug. 26, 1907, *Suksdorf 6090* (P, W); Indian Henry Park, Sept., 1901, *Tarleton 3* (F); rocky banks of Carbon River, Mt. Rainier, Pierce Co., July 27, 1930, *Thompson 5461* (G); wet rocky soil 15 miles east of Stevens Pass, Chelan Co., alt. 3500 ft., May 23, 1931, *Thompson 6436* (G, M); open alpine slopes in Yakima Park, Mt. Rainier, Pierce Co., alt. 6200 ft., July 5, 1931, *Thompson 7225* (M, G, UCal); rocky talus slopes by trail to Col. Bob Lookout, Grays Harbor Co., alt. 4000 ft., July 9, 1931, *Thompson 7278* (G, M, UCal); along alpine streams on Mt. Spokane, Spokane Co., alt. 5000 ft., June 24, 1933, *Thompson 9193* (M); lower meadows on Mt. Stuart, Chelan Co., alt. 5000 ft., July 23, 1933, *Thompson 9581* (M, NY, G, UCal); moist meadows on Tumwater Mountain, Chelan Co., alt. 4000 ft., May 12, 1934, *Thompson 10441* (NY, M); alpine slopes of Stuart Ridge, Chelan Co., alt. 5000 ft., June 19, 1935, *Thompson 11735* (G, CAS); canyons of Cascades, Wellington, Aug. 31, 1901, *Umbach* (F, ANS); creek bank, Cascade Mountains, Wellington, Aug. 31, 1901, *Umbach 519* (NY); coll. of 1889, *Vasey 402* (P); moist rocky soil, 1 mile above camp-ground, White River, Pierce Co., June 16, 1931, *Warren 1493* (W); rocky places at foot of Mt. Stuart, July 29, 1898, *Whited 796* (US, G); Stevens Pass, Chelan Co., Aug. 27, 1901, *Whited 1444* (P, US); Chewaukum, June 16, 1904, *Whited 2513* (P); turfy bank, Paradise River, Mt. Rainier Park, Pierce Co., alt. 6000 ft., Aug. 9, 1921, *Wiegand 2080* (Cl); Mt. Elinor, Olympic Mountains, Aug. 1910, *Zeller* (M).

OREGON: springy place in fir woods, west side of Abbot's Butte on boundary between Jackson & Douglas Counties, alt. about 5200 ft., June 29, 1898, *Applegate 2578* (NY, US); lodgepole pine forest, east base of Bailey Mountain, Diamond Lake, Douglas Co., July 16, 1924, *Applegate 4127* (G); moist coniferous woods, near Rabbit Ears, Upper Rogue River region, Jackson Co., July 13, 1929, *Applegate 5999* (G); edge of brook, Mt. Hood, Cascade Mountains, Hood River Co., alt. 3500 ft., July 31, 1930, *Benson 2492* (US, M, NY); moist ground, Crescent Lake, Cascade Mountains, Klamath Co., July 18, 1928, *Constance 9413* (UM, UCal); moist soil between granite boulders, west end of Lee Lake, lake basin, Wallowa Mountains, Wallowa Co., alt. 7000 ft., Aug. 4, 1935, *Constance & Jacobs 1385* (W); along Union Creek, Huckleberry Mountain, northeast Jackson Co., Aug. 3, 1897, *Coville & Applegate 404* (G, US); Union Co., 1877, *Cusick* (G); subalpine stream bank, Aug. 1896, *Cusick* (UCal); along mountain streamlets, alt. 4000–8000 ft., summer of 1881, *Cusick 211* (F); coll. of 1898, *Cusick 1911a* (G); common, granitic soil, Wallowa Mountains, alt. 2000 m., July 28, 1908, *Cusick 3292* (G, NY, F, US, P, Ry, M, UCal); wet, granite cliffs on peak one mile south of "China Cap," summit of Wallowa Mountains, alt. 2330 m., July 30, 1908, *Cusick 3296* (G, NY, F, P, US, M, UCal, Ry); very common, Wallowa Mountains, alt. 6500 ft., July 28, 1908, *Cusick 3392* (US); near Coman Springs, Blue Mountains, Umatilla Co., alt. 4500 ft., June 24, 1910, *Cusick 3474* (P); moist woods, near highway, east side of Mt. Hood, Hood River Co., July 4, 1926, *English 134* (P); moist rich ground, Mirror Lake, Mt. Hood, Clakamas Co., alt. 4000 ft., Aug. 5, 1927, *English 800* (P, ANS); Wallowa Mountains, near Aneroid Lake, Aug., 1912, *Finley 8766* (G); Boise National Forest, coll. of 1912, *Grandjean 84* (US); rather open rich woods, Loop Highway east of Mt. Hood, June 2 and June 10, 1924, *Henderson 647* (G, M); Diamond Lake, Douglas Co., June 21, 1931, *Howell 6881* (CAS); Wallowa Lake, July, 1930, *Jones 25016* (M, CAS, P); Cornucopia, July 27, 1931, *Jones 28914*

(CAS, M, UCal); Wenaha National Forest, alt. 4100 ft., July 31, 1916, *Lawrence 81* (US); rocky summit of Bald Mountain, near Detroit, Marion Co., alt. 7500 ft., Aug. 14, 1917, *Nelson 1910* (G); low thicket, east end of Parmelia Lake, alt. 4000 ft., Aug. 13, 1919, *Nelson 2786* (G); swamp along railroad, west end of Odell Lake, Klamath Co., July 29, 1928, *Nelson 5091* (G); wet ground, head of Parmelia Lake, foot of Mt. Jefferson, Aug. 14, 1919, *Peck 9233* (Willm, M, F, NY); moist thicket, 3 miles west of Whitney, Baker Co., July 22, 1921, *Peck 10356* (Willm, NY); damp ground, Clackamas Lake, July 23, 1927, *Peck 15817* (Willm); moist thicket, 4 miles east of Pendelton, Umatilla Co., July 1, 1933, *Peck 17464* (Willm); stream bank, Aneroid Lake, Wallowa Co., July 28, 1933, *Peck 17915* (Willm); in gravelly places along streams, Duck Lake Fork, Whitman National Forest, alt. 4500 ft., July 20, 1912, *Peterson 125* (US); Bald Knob, alt. 6500 ft., June 23, 1907, *Sampson & Pearson 26* (US); along Griffith's Creek, alt. 4650 ft., July 15, 1897, *Sheldon 8577* (NY), and *Sheldon 8577b* (US); slopes of Bluegrass Ridge, Aug. 5, 1927, *Thompson 3466* (ANS); dry ground above Mirror Lake, alt. 4500 ft., Aug. 17, 1927, *Thompson 3566* (ANS); moist woods at head of Wallowa Lake, Wallowa Co., June 15, 1928, *Thompson 4804* (US, G, ANS, M); damp draws on road to Elk Meadows, Mt. Hood, July 22, 1928, *Thompson 5077* (G, ANS, US, M).

WITHOUT EXACT LOCALITY: Columbia River, *Nuttall* (ANS).

Mertensia paniculata is the most widely distributed of the North American inland species of the genus. It occurs, as far as specimens indicate, from the region of James Bay in Quebec south to the Great Lakes, thence sparingly westward to Alberta and British Columbia where it is again rather abundant; from there it extends through Alaska. South of the international boundary, in the eastern part of its range, it is found in Michigan, Wisconsin, Minnesota, and at one known station in Iowa. In the western part of its range, it has been collected in the panhandle of Idaho and adjacent Montana and Washington. Whether or not it occurs in Siberia is not known, no specimens having been seen.

Mertensia paniculata, with its two varieties, is the most difficult of definition of the taller species of *Mertensia.* Variation is found in a most bewildering degree. In the eastern part of its range, the species is fairly constant, although the degree of pubescence varies to a small extent. From Alaska down through Alberta and British Columbia it is again fairly constant except as to degree of pubescence. The degree of variation is relatively greater than in the eastern plants, some plants being densely pilose, some sparsely pubescent. In those of Montana, Idaho, and Washington, and in some of the adjacent region of Canada, the normal aspect of the species is changed by the spreading character of the pubescence, especially on the pedicels and the calyx. In addition to the character of the pubescence the corollas are, on the average, slightly smaller. The calyces on many plants are smaller and of no consistent shape. This minor variation has been separated as *M. membranacea;* however, there seems not to be sufficient reason to separate it. The presence or absence of pubescence on the backs of the calyx-lobes is subject to variation. Typically the backs of the calyx-lobes are strigose; this shades into a phase in which they are quite glabrous. This variation has been found both in plants of eastern North America, where it is uncommon, and in western North America where it is common. Both phases have been found in the same collection and even on flowers in the same inflorescence.

M. paniculata var. *borealis.*—In Montana, Idaho, southern British Columbia, Washington, and Oregon, there is a group of plants in which the minor deviations from the species are most puzzling. Several of these phases have received names, and others have escaped attention. From a variation hardly to be distinguished from the species, one finds various phases, differing one from another only slightly, ranging to glabrous plants. This latter is the basis of Piper's *M. laevigata.* In the attempt to find lines of cleavage between the various phases by which they might be separated, it was soon discovered that while many of the specimens could be placed with one or another phase, an equal amount could not be placed with any particular one. If a restricted view were to be taken of the various phases, a large number of them would have to be given subspecific rank. Such a course would serve no good purpose but rather would cause greater confusion than already exists. To be consistent, if a restricted view were taken of the several phases according to their pubescence, still further segregation would be in order based on inconstant calyx and corolla characters.

Mertensia paniculata var. *alaskana* is a relatively unimportant variation, and again one in which there is no clear or sharp morphological line distinguishing it from the species occurring in Alaska and the Yukon. From its more perplexing ally further to the south, *M. paniculata* var. *borealis,* it is separated by a large hiatus in range.

5. **Mertensia franciscana** Heller in Bull. Torr. Bot. Club **26**: 549. 1899.

M. pratensis Heller, *l.c.* 550.
M. alba Rydb. in Bull. Torr. Bot. Club **31**: 638. 1904.
M. grandis Wooton & Standley in Contr. U. S. Nat. Herb. **16**: 165. 1913.
M. pratensis f. *alba* Macbride in Contr. Gray Herb. N.S. No. 48: 8. 1916.

Stems erect or ascending, 1–10 dm. tall (rarely up to 16.5 dm.), usually with several from each rootstalk; basal leaves oblong-elliptic to elliptic, 6–20 cm. long, 5–9 cm. broad, base subcordate to obtuse, apex acuminate, acute, or obtuse, upper surface short-strigillose, lower surface glabrous or with spreading pubescence, petioles longer or shorter than the blade; cauline leaves elliptical to narrowly ovate, 4–14 cm. long, 1–5 cm. broad, obtuse to acuminate, the lowermost petiolate, becoming sessile toward the inflorescence, strigillose on the upper surface, glabrous to densely pubescent with spreading hairs below; flowers of the inflorescence paniculately disposed in an ebracteate modified scorpioid cyme, the branches of the inflorescence elongating in age; pedicels strigose, 1–20 mm. long; calyx 2.5–5 mm. long, divided almost to the base, the lobes linear to lanceolate, 1–2 mm. wide at the base, acute, rarely obtuse, glabrous or pubescent on the back, strongly ciliate; corolla-tube 5–9 mm. long (mostly about 6 mm.), glabrous or pubescent within; corolla limb 4–9 mm. long (mostly about 6 mm.), subequal to or slightly shorter or longer than the corolla-tube, moderately expanded; anthers 2.5–3 mm. long, longer than the filaments; filaments 2–2.5 mm. long, glabrous or with spreading hairs; fornices prominent, usually pubescent; style 9–20 mm. long, usually shorter than the corolla, sometimes exceeding it; nutlets rugose and papilliferous.

Distribution: southern Colorado, New Mexico, Arizona, southern Utah, eastern Nevada, and possibly California.

COLORADO: Van Boxde's Ranch, above Cimarron, 8500 ft., July 10, 1901, *Baker 391* (US, P, M, G, ND, UCal, O, Ry); common along river bottom, Mancos, alt.

7500 ft., June 22, 1898, *Baker, Earle & Tracy 42* (ND, M, US, Cl, N, NY, O, F); Bob Creek, West La Plata Mountains, alt. 10,000 ft., June 29, 1898, *Baker, Earle & Tracy 234* (Cl, ND, AM, US, M, N, NY, O, G, F, UCal, Ry, Clokey); common on dry rocky summits, above timber line, Mt. Hesperus, June 30, 1898, *Baker, Earle & Tracy 252* (US, NY, O, Ry, ND, M, N, Cl, F); La Plata River, 10,500 ft., July 13, 1898, *Baker, Earle & Tracy 825* (NY TYPE of *M. alba*, F, ND, M, N, Cl, NY, US); Trinidad, July, 1915, *Beckwith 154* (CAS); Keating, Fremont Co., June 25, 1916, *Comstock 15* (Cl); Needle Mountains quadrangle at Camp Creek, alt. 10,500 ft., July 10, 1901, *Cross 6* (US); short distance west of summit of Wolf Creek Pass, San Juan Mountains, alt. 10,600 ft., June 7, 1934, *Ferguson & Ottley 5381* (G); La Veta Pass, June 11, 1901, *Ferril* (Clokey, C); Granite Peaks, west side of Los Piños River, La Plata Co., May 26, 1934, *McKelvey 4666* (G); between Pagosa Springs and Wolf Creek Pass, Mineral Co., alt. about 7500 ft., May 28, 1934, *McKelvey 4722 in part* (G); Goose Creek, Rio Grande National Forest, Mineral Co., June 18, 1911, *Murdoch 4610* (US, M, F, UCal, Clokey); Park, Rio Grande National Forest, Mineral Co., July 4, 1911, *Murdoch 4669* (F, M); Rico, Dolores Co., June 15, 1899, *Osterhout 1870* (O, NY); shady aspen grove, Tabegauche Basin, alt. 8000 ft., July 29, 1914, *Payson 552* (Ry, G); in shade near Sheep Creek, western Montrose Co., alt. 7000 ft., July 6, 1924, *Payson & Payson 3905* (Ry, G); Beulah, June 5–9, 1908, *Robbins 4936* (C, Ry); West Spanish Peak, alt. 3000–3800 m., July 9, 1900, *Rydberg & Vreeland 5683* (NY); Cuchara River, above La Veta, alt. 2100 m., May 31, 1900, *Rydberg & Vreeland 5685* (NY, Ry, N, O, ND); Granite Peaks Ranch, north of Bayfield on Pine River, alt. 8500 ft., May 26, 1934, *Stone 511* (NY); Culebra Cañon, Costilla Co., 9000 ft., July 7, 1912, *Warren* (Ry); along a creek in moist humid soil, 14 miles south of Trinidad toward Raton Pass, Las Animas Co., June 24, 1935, *Williams 2273* (W, M, ND, P).

NEW MEXICO: vicinity of Las Vegas, San Miguel Co., July, 1920, *Anect 51* (US); vicinity of Las Vegas, Solitario, July 9, 1926, *Arsène 17902* (G); Lake Peak, alt. 3780 m., Aug. 26, 1928, *Arsène 20756* (G); vicinity of Santa Fe, canyon east, alt. 2400 m., July 20, 1926, *Arsène & Benedict 15728* (US, F); Pecos Baldy, alt. 11,000 ft., July 30, 1903, *Bailey 575* (US); Taos Mountains, Taos Co., alt. 11,400 ft., July 28, 1904, *Bailey 881* (US); along creeks, Santa Fe Mountains, June 15, 1925, *Benedict 112* (US); Holy Ghost Canyon, July 5, 1929, *Castetter 73* (Ry); Panchuela Creek above Cowles, July 5, 1931, *Castetter 1071* (Ry); Las Vegas Mountains, coll. of 1901, *Cockerell* (CAS); Beulah, alt. 8000 ft., 1903, *Cockerell* (AM); top of Las Vegas Range, alt. 11,000 ft., coll. of 1901, *Cockerell 17* (NY), and *20* (Ry); Pecos River, July 17, 1898, *Coghill 67* (M); Chama, Rio Arriba Co., alt. 2380 m., May 26, 1911, *Eggleston 6652* (US); between Mogollon Ranger Station and Willow Creek (Silver-Willow Creek divide), Gila Forest, Socorro Co., alt. 2100–2900 m., July 29, 1920, *Eggleston 16845* (US, NY); lower Forest Service Cabin, Sierra Blanca, Sacramento Mountains, Lincoln Forest, Lincoln Co., alt. 3100 m., July 29, 1923, *Eggleston 18835* (US, NY); at junction of Rio Junita and Rio Martinez above Tres Ritos, Carson Forest, Taos Co., Aug. 27, 1923, *Eggleston 19332* (US); Ritos de los Frijoles, Bandelier National Monument, Sandoval Co., alt. 2000–2200 m., June 5–6, 1924, *Eggleston 20021* (US, NY); Santa Fe Creek bottom, banks of stream, June and July, 1847, *Fendler 626* (M, ANS, US, F, G, NY); in Santa Fe Cañon, 9 miles east of Santa Fe, alt. 8000 ft., June 2, 1897, *Heller & Heller 3641* (M, ND, N, G, NY TYPE of *M. pratensis*, US, P, Cl); sandy soil, Rio Monito, May, *Henry* (ANS); upper Pecos River, July 17, 1898, *Maltby & Coghill 67* (US, AM); cañon in Chusca Mountains, July 3, 1883, *Marsh 177* (US); in the Mogollon Mountains, on Mogollon Creek, Socorro Co., alt. 7500 ft., July 23, 1903 *Metcalfe 302* (US, NY, G, Ariz, Ry, M, ND, AM); in and around the south end of the Black Range, Hillsboro Peak, Grant Co., alt. 8500 ft., Sept. 11, 1904, *Metcalfe 1319* (G, US TYPE of *M. grandis*, M, AM); Redstone, Aug. 13, 1895, *Mulford 850* (NY, M); near Kingston, Black Range, Sierra Co., Aug. 1915, *Pilsbry* (ANS, US); Mogollon Mountains, July, 1881, *Rusby* (M); Mogollon Mountains, Aug., 1881, *Rusby 291* (ND, US, F, UCal, NY, Cl, M); Winsor's Ranch, Pecos River National Forest, alt. 8400 ft., June 29, 1908, *Standley 4020* (AM, M, US, NY, F, G); Pecos Baldy, Pecos River National Forest, alt. 12,000 ft., July 11, 1908, *Standley 4307* (M, AM, US, NY); Spirit Lake, Pecos River National Forest, alt. 10,000 ft., July 18, 1908, *Standley 4388* (AM, M, US, NY); Harvey's upper ranch, Pecos River National Forest, alt. 9600 ft., Aug. 1, 1908, *Standley 4709* (AM); Truchas Peak, Pecos National Forest, alt. 12,000 ft., Aug. 8, 1908, *Standley 4786* (AM); along the river, vicinity of Chama, Rio Arriba Co., alt. 2380–2850 m., July 8, 1911, *Standley 6524* (US); bogs, Navajo Indian Reservation, in the Tunitcha Mountains, Aug. 8, 1911, *Standley 7665* (US); edge of brook, vicinity of Ute Park, Colfax Co., alt. 2200–2900 m., Aug. 21, 1916, *Standley 13476* (US); open hillside, vicinity of Ute Park, Colfax Co., alt. 2200–2900 m., Aug. 31, 1916, *Standley 14109* (US); along brook under aspens, vicinity of Ute Park, Colfax Co., alt. 2900 m., Aug. 31, 1916, *Standley 14130* (US); edge of brook, vicinity of Brazos Canyon, Rio Arriba Co., Aug. 21, 1914, *Standley & Bollman 10699* (US); Comanche Valley, Colfax Co., alt. 8500 ft., July, 1896, *St. John 22* (G); rich moist soil, Raton road, 19 miles east of Taos, Colfax Co., alt. 8800 ft., June 5, 1922, *Wiegand & Upton 4134* (Cl); Sierra Blanca Peak, Mescalero Indian Reservation, Otero Co., alt. 9300 ft., July 20, 1928, *Wolf 2834* (CAS, G); 3 miles north of Chama, Rio Arriba Co., alt. 8000 ft., July 25, 1928, *Wolf 2977* (G, CAS); White Mountains, alt. 7800 ft., July 6, 1895, *Wooton* (AM); Silver Spring Canyon, Sacramento Mountains, July 28, 1899, *Wooton* (US); east of Holt's Ranch, alt. 6000 ft., July 20, 1900, *Wooton* (AM); near Holt's Ranch, Mogollon Mountains, Socorro Co., July 20, 1900, *Wooton* (US); Eagle Peak, Aug. 2, 1900, *Wooton* (AM); White Mountain Peak, Aug. 1, 1901, *Wooton* (US, NY, AM); Costilla Valley, alt. 10,000 ft., Sept. 6, 1913, *Wooton* (US); White Mountains, Lincoln Co., alt. 10,000–11,000 ft., Aug. 16, 1897, *Wooton 649* (ND, US, NY, M).

ARIZONA: narrow space between 2 high granite walls, 1 mile south of Fly Peak, Chiricahua Mountains, alt. 9000 ft., *Blumer Pr37* (Ariz, US); Pinchot Ranger Station, Mogollon Mountains, Coconino Co., alt. 1950–2280 m., *Collom* (NY); Pinchot Ranger Station, Mogollon Mountains, Coconino Co., alt. 1950–2280 m., *Collom 237* (M); San Francisco Mountains, alt. 10,000 ft., July 16, 1927, *Foster & Osborn 4810* (US); Coronado Trail, Sept. 7, 1931, *Fulton 8209* (F); in aspen groves, Miller's Peak and slope, Huachuca Mountains, July 12, 1909, *Goodding 178* (G, Ariz, NY, Ry); among rocks of lava heap, Thompson's Ranch, Black River, White Mountains, July 12, 1910, *Goodding 540* (NY, US, Ariz, Ry, G); below cliffs, Black River, Thompson's Ranch, White Mountains, July 14, 1910, *Goodding 594* (NY, US, Ariz, Ry, G); in meadows, Sheep Crossing, Little Colorado River, July 13, 1912, *Goodding 1173* (NY, Ariz, US, Ry); Mt. San Francisco, July 9, 1889, *Greene* (ND); White Mountains, Aug. 11–15, 1903, *Griffiths 5345* (US); open slopes, near Flagstaff, alt. 8500 ft., July 28, 1922, *Hanson 145* (Ry); in spruces, San Francisco Mountains, alt. 10,000 ft., June 30, 1923, *Hanson & Hanson A605* (Ry, N, F, M); San Francisco Peak, Aug. 30, 1884, *Jones 4106* (Ry, CAS, F, US, Ariz, U); Mt. Graham, alt. 9500 ft., Aug. 12, 1934, *Kearney & Peebles 9960* (US); Mt. Humphrey, alt. 8600–10,500 ft., July 30, 1897, *Kuntze* (NY); Chiricahua Mountains, alt. 9000-9500 ft., July 15–20, 1927, *Kusche* (F, CAS, NY); western slopes of San Francisco Peaks, alt. 2600 m., June 25, 1901, *Leiberg 5582* (US); upper Smith Creek, alt. 3000 m., July 27, 1901, *Leiberg 5765* (US, Clokey); San Francisco Mountains, Aug., 1884, *Lemmon* (UCal); Sitgreaves Mountain, Aug., 1884, *Lemmon & Lemmon* (US); San Francisco Mountains, Aug., 1884, *Lemmon & Lemmon* (UCal, N); vicinity of Flagstaff, alt. 7000 ft., July 5, 1898, *MacDougal 232* (F, UCal, Ariz, US, NY TYPE, Cl, Ry, ANS, G); level plateau, San Francisco Mountains, alt. 8000 ft., June 16, 1891, *MacDougal 251* (US); Schultze Pass, San Francisco Mountains, June 6, 1929, *McKelvey* (CAS); cañon of Clear Creek, 50 miles from confluence with Rio Verde, July 25, 1887, *Mearns 162* (NY); between Fort Huachuca and San Pedro River, July 27, 1893, *Mearns 1547* (US, NY, G); Willow Spring, July 5–6, 1890, *Palmer 619* (US, G); near Flagstaff, May–Oct., 1899, *Purpus* (UCal); San Francisco Mountains, May–Oct., 1900, *Purpus* (M); Willow Spring, alt. 7400 ft., July, 1874, *Rothrock 246* (F, G, US); San Francisco Mountains, Summit Ranch, Aug. 18, 1907, *Thornber 2843, 2862, 2876* (Ariz); Greer, June 13–15, 1917, *Thornber 8925* (Ariz); Graham, *Thornber & Shreve 7931, 7951* (Ariz); San Francisco Mountains, July 20, 1894, *Toumey* (UCal, NY); San Francisco Mountains, July 14, 1892, *Toumey 352* (Ariz, US); San Francisco Mountains, Coconino Co., alt. 13,000 ft., Aug. 2, 1928, *Wolf 3116* (CAS, G); Hart's Little Spring, July 14, 1892, *Wooton* (US).

UTAH: Gooseberry Ranger Station, Fishlake National Forest, Wasatch Mountains, Sevier Co., alt. 2400 m., June 24, 1914, *Eggleston 10164, 10168* (US); headwaters of the south forks of Salina Creek, Wasatch Mountains, Fishlake National Forest, Sevier Co., alt. 3100 m., July 28–30, 1914, *Eggleston 10302* (US); Mt. Hilgard, Wasatch Mountains, Fishlake National Forest, Sevier Co., alt. 3000 m., Aug. 1, 1914, *Eggleston 10344* (US); in moist meadow, north slope of Abajo Mountains, alt. 8500–11,000 ft., July 1–2, 1930, *Goodman & Hitchcock 1387* (G, NY, UCal, O, CAS, M); north slope Abajo Mountains, alt. 8500–11,000 ft., July 1–2, 1930, *Goodman & Hitchcock 1443* (CAS, UCal, NY, O, G, M, ANS, UM); Fish Lake, Aug. 10, 1894, *Jones* (UCal); Silver Lake, American Fork Cañon, alt. 10,000 ft., July 20, 1895, *Jones* (U); Silver Lake, American Fork Cañon, alt. 10,000 ft., July 23, 1895, *Jones* (G); Ireland's Ranch, head of Salina Cañon, alt. 8000 ft., June 15, 1894, *Jones 5441aa* (US, NY, UCal); mesa south of Devil's Canyon, 10 miles north of Blanding, July 1, 1932, *Maguire & Redd 2109* (U); Abajo Peak, alt. 11,000 ft., July 1, 1932, *Maguire & Redd 2110* (U); about spring below cabin, and along grassy stream bank, Abajo Mountains, alt. 9500 ft., June 24, 1932, *Maguire & Redd 2111* (U); in damp woodland, Dream Mine, San Juan Co., alt. 9000 ft., June 28, 1932, *Maguire & Redd 2112* (U); West Mountain, Abajo Mountains, alt. 10,000 ft. to summit, June 29, 1932, *Maguire & Redd 2113* (U); in older thicket along stream, vicinity La Sal Ranger Station, San Juan Co., alt. 7000 ft., July 2, 1932, *Maguire & Redd 2115* (U); under *Ribes*, in meadow, Burro Pass, Grand Co., alt. 11,400 ft., July 18, 1933, *Maguire, Richards, Maguire & Hammond 5118* (U, G); spruce woods, head of Horse Canyon, San Juan Co., alt. 9500 ft., July 26, 1933, *Maguire, Richards, Maguire & Hammond 5121* (G); spruce forest, La Sal Mountains, Grand Co., alt. 10,500 ft., July 22, 1924, *Payson & Payson 3949* (UCal, G, M, Ry); western slope of La Sal Mountains, alt. 2200–3000 m., July 6, 1911, *Ryd-*

berg & Garrett 8597, 8598 (Ry, US, NY); Elk Mountains, near Scorup's Camp, alt. 2500 m., Aug. 8, 1911, *Rydberg & Garrett 9531* (US, NY); Abajo Mountains (eastern range), alt. 3000–3300 m., Aug. 17, 1911, *Rydberg & Garrett 9775, 9776* (Ry, NY); Abajo Mountains, near Spring Creek, alt. 2700–3000 m., Aug. 17–20, 1911, *Rydberg & Garrett 9814* (US, NY); wet canyon bottoms, Geyser Canyon, San Juan Co., alt. 8700 ft., July 11, 1912, *Walker 256* (Ry, M, US, NY, G).

NEVADA: along stream, Baker-Lehman Creek, White Pass Co., alt. 7500 ft., June 20, 1928, *Cottam 3283* (F).

CALIFORNIA: Sierra Valley to the high valleys of the Warner Mountains, June 1879, *Lemmon* (NY, UCal).[1]

6. **Mertensia platyphylla** Heller in Bull. Torr. Bot. Club **26**: 548. 1899.

M. paniculata var. *platyphylla* G. N. Jones in Univ. Wash. Publ. Biol. **5**: 220. 1936.

Stems erect, 3–9 dm. tall, one or few stems from the root; basal leaves ovate-subcordate, 12 cm. more or less long, 10 cm. more or less broad, acute or acuminate, minutely strigillose above, sparingly hirsute below, the basal portion often nearly glabrous, petiole much longer than the blade (25 cm. more or less); cauline leaves usually petiolate, the uppermost sessile, lanceolate-acuminate to ovate-acuminate, 4–14 cm. long, 2–7 cm. broad, pinnately veined, pubescence as of basal leaves; inflorescence a modified scorpioid cyme, congested at first, becoming elongated in age; pedicels 2–40 mm. long, strigose; corolla blue probably also occasionally white, the tube 4.5–6 mm. long, glabrous or very rarely with a few hairs within, the moderately expanded limb 6–9 mm. long, always longer than the tube, fornices conspicuous, glabrous or rarely with extremely short hairs; anthers 3.7–5 mm. long (usually 4 mm.), their bases about even with the fornices or not more than 1 mm. above them; filaments 1.5–2.5 mm. long, about as broad as the anthers; style as long as or usually exceeding the corolla; calyx 5–7 mm. long at anthesis, up to 12 mm. long at fruiting stage, the lobes 0.5–1 mm. shorter than the calyx, linear to lanceolate, acute, densely ciliate, usually glabrous on the back, rarely sparingly strigose; nutlets large, 5–7 mm. long, rugose dorsally and smooth on the inner faces or rugose on all faces, rarely all developing.

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[1] This collection is probably mislabeled. It may be the same collection as *Lemmon 2831*, from Arizona.

Distribution: western Washington.

WASHINGTON: Puyallup, Puget Sound, July 17, 1880, *Engelmann* (M); stream banks, Montesano, June 1917, *Grant* (NY, C, US); river bottom, Montesano, July, 1919, *Grant* (M, NY); fields, Montesano, *Grant 831* (P); near Montesano, alt. 200 ft., June 3, 1898, *Heller & Heller 3872* (US, M, Ry, ANS, P, UCal, F TYPE, G, N, Cl, NY); Skokomish River, Mason Co., May 16, 1892, *Kincaid* (P); New London, Grays Harbor Co., June 10, 1897, *Lamb 1168* (F, P, ANS, NY, M); moist river bottoms near Aberdeen, Grays Harbor Co., May 4, 1935, *Thompson 11433* (G); Nisqually, Puget Sound, *Wilkes* (NY); Palace Camp, coll. of 1883, *Willis* (NY).

6a. M. platyphylla var. **subcordata** (Greene), comb. nov.

M. subcordata Greene, Pittonia **4**: 89. 1899.

M. paniculata var. *subcordata* Macbr. in Contr. Gray Herb. N.S. No. 48: 7. 1916.

As the species except: calyx 2.5–4 mm. long, broadly lanceolate, triangular or oblong, usually obtuse, occasionally acute; cauline leaves occasionally slightly subcordate, old specimens sometimes almost entirely glabrous.

Distribution: western Oregon.

OREGON: Coquille River, midway between Bridge and Myrtle Point, Coos Co., May 13, 1924, *Abrams & Benson 10540* (Ry, Willm); Umpqua River, Douglas Co., 1914, *Cusick 3875* (P); in small clumps in thickets, bank of Umpqua River, Roseburg Quadrangle, Douglas Co., April 17, 1914, *Cusick 3895* (P); Willamette River banks, Milwaukie, Clackamas Co., May, 1886, *Drake & Dickson* (F); Corvallis, Benton Co., May, 1922, *Epling 5578* (M); Silver Creek, coll. of 1871, *Hall 405* (M, G, F); Milwaukie, Clackamas Co., Aug., 1880, *Howell* (P); Roseburg, Umpqua Valley, Douglas Co., May 3, 1887, *Howell* (ND TYPE, UCal, NY, M, F); Cascade Mountains, June 25, 1895, *Lloyd* (NY); low woods along Willamette River, West Salem, Polk Co., May 25, 1916, *Nelson 607* (P); wet ledges on side of Silver Creek Falls, Marion Co., June 8, 1916, *Nelson 669* (P); low woods near river, West Salem, Polk Co., May 8, 1917, *Nelson 1111* (G, NY); low woods near river, West Salem, Polk Co., May 12, 1918, *Nelson 2137* (G); rocky shore of stream, Silver Creek Falls, Marion Co., June 19, 1918, *Nelson 2255* (G); low woods along Willamette River, West Salem, Polk Co., April 16, 1921, *Nelson 3495* (ANS); rocky ravine, Silver Creek Falls, Marion Co., June 9, 1921, *Nelson 3794* (ANS); Columbia woods, *Nuttall* (ANS); Port Oxford, Curry Co., May 5, 1931, *Osbanie* (Willm); damp woods along river, Salem, May 27, 1911, *Peck 5349* (Willm); damp woods along river, Salem, April 23, 1910, *Peck 5350* (Willm); damp woods, Cottage Grove, June 15, 1916, *Peck 7443* (Willm); moist shade along Willamette River, near Salem, May 15, 1935, *Peck 18654* (Willm); west of Corvallis, Benton (?) Co., May 1, 1933, *Rounds* (M); on hills, Yamhill Co., June 29, 1893, *Spillman 131* (P, F); Independence, Polk Co., May 20, 1893, *Stanton 72* (P); banks of Clatskanie River, 5 miles above Clatskanie, Columbia Co., May 15, 1927, *Thompson 2425* (M); rocky banks of Clatskanie River, 5 miles above Clatskanie, Columbia Co., May 15, 1927, *Thompson 2430* (ANS); near Astoria, Clatsop Co., June, 1927, *Van Dyke* (CAS).

The most outstanding character of this species and variety is the very large anthers, almost always 4 mm. long, in comparison to those of closely related *M. paniculata* and its varieties in which the anthers rarely exceed 3 mm. The corolla is broad in comparison to that of the related plants and gives a distinctive appearance to the species and variety.

The pubescence on the lower surface of the leaves is always sparse, that of the upper surface is inconspicuous and closely appressed. In older specimens it may nearly all have broken off, but the surface remains scabrid to the touch because of the remaining pustulate bases.

Various interpretations have been given to the plants here concerned. Piper maintained both of them in his flora of Washington (although the variety is not known from Washington). Macbride, in his revision of the western species of the genus, maintained *M. platyphylla* as a species but assigned *M. subcordata* to *M. paniculata* as a variety. Johnston (Contr. Arnold Arb. No. 3: 85–86. 1932) used *M. paniculata* var. *subcordata* as a convenient name to assign to the complex assemblage of species and varieties allied to *M. paniculata* which Piper had described or used in his flora of Washington, as well as one more name published by Macbride in his revision. *Mertensia platyphylla* and a more distantly related species were thus included. Later Piper came to the conclusion that *M. platyphylla* was the same as *Lithospermum denticulatum,* probably from the statement of locality in Hooker, Fl. Bor.-Am. **2**: 87. 1838.

The characters here used to separate the species and the variety are minor, but they do not seem to overlap and their ranges apparently do not come together.

7. **Mertensia toyabensis** Macbr. in Contr. Gray Herb. N.S. No. 48: 7. 1916.

Stems erect, few, 3–5 dm. tall; roots and basal leaves unknown; cauline leaves oblong-lanceolate to elliptic, 3–14 cm. broad, the lower ones petiolate, the petiole somewhat shorter than the blade, the upper ones becoming sessile and smaller in size, densely pubescent on both surfaces with short spreading hairs, lateral venation inconspicuous; pedicels 2–10 mm. long, pubescent with spreading hairs; inflorescence a modified scorpioid cyme, congested at first, becoming panicled; corolla-tube 5–8 mm. long (mostly 5–6 mm.), hairy within toward the base; corolla-limb 6–8 mm. long (mostly 6–7 mm.), moderately expanded; fornices conspicuous, pubescent; anthers 2–2.5 mm. long; filaments 2.5–3 mm. long; style equalling or shorter than the corolla; calyx 4–7 mm. long, divided almost to the base, lobes linear-lanceolate to lanceolate, acute, pubescent with more or less spreading hairs; nutlets rugose, 3–4 mm. long.

Distribution: known only from Lander Co., Nevada.

NEVADA: Austin, June 16, 1882, *Jones 4007* (US, M, U, Clokey, Pom, G, NY, CAS); Toyabe Mountains, alt. 7000 ft., July, 1868, *Watson 843* (G, NY).

Mertensia toyabensis is closely allied to *Mertensia arizonica* and its varieties. More collections are desired for a better understanding of the species.

8. **Mertensia arizonica** Greene, Pittonia **3**: 197. 1897.[1]

Erect or ascending, 3–8 dm. or more tall, stems 1–several from each rootstalk; basal leaf (only one seen) narrowly ovate, acute, 15 cm. long, 6 cm. broad, slightly decurrent on the petiole, petiole as long as the blade, glabrous but slightly papillate, margin ciliate; lower cauline leaves from spatulate to elliptical, usually petiolate, the petiole winged, upper cauline leaves usually sessile, elliptical to narrowly ovate, acute, 3–12 cm. long, 1–5 cm. broad, glabrous or papillate, ciliate on the margins, not becoming abruptly smaller upward; pedicels 2–30 mm. long, glabrous, papillose or sometimes the papillae developing short hairs; inflorescence usually branched, the peduncles bearing a several-flowered elongated scorpioid cyme; calyx 4–8 mm. long, campanulate, glabrous on the back, hairy within, the lobes one-half or less the entire length of the calyx, 2–4 mm.

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[1] Doubtful that *M. arizonica* and more particularly *M. Palmeri*, were collected in Arizona by Dr. Palmer, I wrote to Dr. F. V. Coville concerning them. A part of Dr. Coville's answer follows: "I have looked up Dr. Palmer's itinerary for 1869, and I find that most of his collections from Arizona, including all of his Arizona plants of that year except a few from the southern part of the state, were shipped by steamer from Ehrenberg down the Colorado River and by way of the Gulf of California to San Francisco. They were then reshipped in a steamer for the Isthmus of Panama and the steamer carrying the collection was lost. I am confident that the specimens labeled . . . 'as collected by Dr. Edward Palmer in Arizona in 1869' are erroneously labeled."

long, acute or obtuse, ciliate; corolla-tube 6–9 mm. long, with a definite ring of hairs at the base within; corolla-limb 7–11 mm. long, always longer than the tube, moderately expanded; anthers 2.5–3.5 mm. long, as long as or shorter and narrower than the filaments, filaments 3–4 mm. long; fornices conspicuous, pubescent; style 10–15 mm. long, usually shorter than the corolla; nutlets rugose, shorter than the calyx.

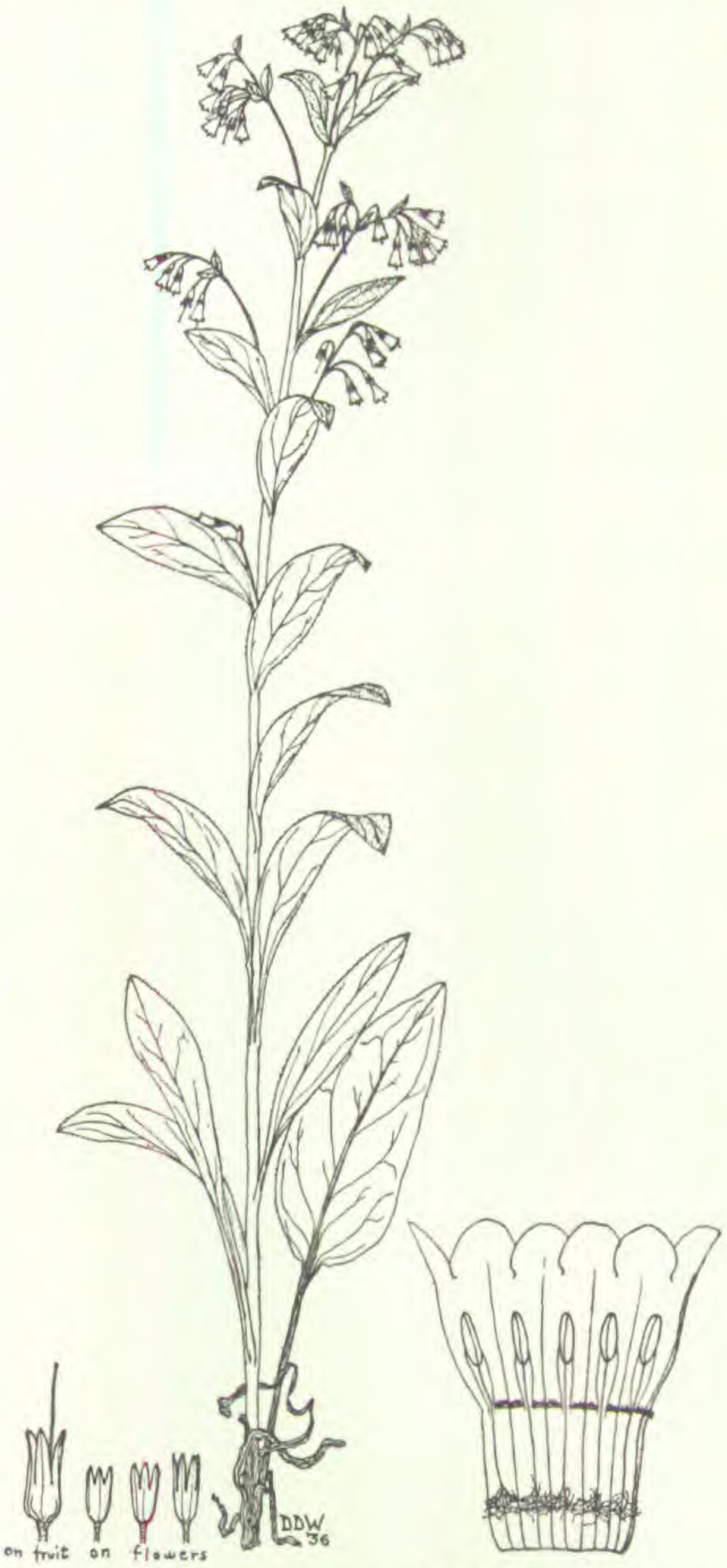

Fig. 4. *M. arizonica.* Habit sketch × ⅛; enlarged corolla × 1⅔; variation in calyx × ⅔.

Distribution: central to southwestern Utah, probably also in adjacent Arizona.

"ARIZONA": without definite locality, coll. of 1869, *Palmer* (US TYPE).

UTAH: Tushar Ranger Station, headwaters of Beaver Creek, Fillmore National Forest, Tushar Mountains, Beaver Co., Aug. 8–9, 1914, *Eggleston 10399* (US); creek banks, Pine Valley Mountain, May 17, 1902, *Goodding 855* (Ry, Cl, M); Cienega, 6 miles west of Panguitch Lake, alt. 9000 ft., July 17, 1930, *Goodman & Hitchcock 1578* (UCal, O, G, F, ANS, NY, CAS, UM, M); gravel, Marysvale, alt. 8900 ft., 1894, *Jones 5375W* (US); Brigham Peak, Mt. Ellen, Henry Mountains, alt. 10,500 ft., Aug. 29, 1894, *Jones 5957a* (US); in meadows at Cedar Breaks, Iron Co., Aug. 6, 1934, *Maguire 12995* (M, G, U); meadows above the Breaks, Cedar Breaks, alt. 10,000–11,000 ft., July 19, 1929, *Mathias 686* (G, M); St. George, coll. of 1875, *Palmer* (NY); Beaver Valley, coll. of 1877, *Palmer 347* (NY, M); mountains north of Bullion Creek, near Marysvale, July 23, 1905, *Rydberg & Carlton 7061* (NY); mountains north of Bullion Creek, near Marysvale, July 23, 1905, *Rydberg & Carlton 7077* (NY, G); Bullion Cañon, in and near the Gorge, July 27, 1905, *Rydberg & Carlton 7285* (NY, US, Ry); Zion National Park, June 6, 1929, *Woodbury 29* (US).

8a. Mertensia arizonica var. **Leonardi** (Rydb.) Johnston in Contr. Arnold Arb. No. 3: 83. 1932.

M. Leonardi Rydb. in Bull. Torr. Bot. Club **36**: 680. 1909.

M. Sampsonii Tidestrom in Proc. Biol. Soc. Wash. **26**: 122. 1913.

M. arizonica var. *umbratalis* Macbr., acc. to Macbride in Contr. Gray Herb. N. S. No. 48: 9. 1916, as to synonyms *M. Leonardi* and *M. Sampsonii,* and specimens cited from Utah except *Pammell & Blackwood 3820*.

Very similar to the species; calyx 4–8 mm. long, divided almost to the base, the lobes 3–7 mm. (rarely 2 mm.) long, lanceolate, acute, ciliate; anthers and filaments averaging slightly shorter than in the species.

Distribution: central to north-central Utah and southwestern Wyoming.

WYOMING: moist valley, Aspen Station, Union Pacific Railway, July 9, 1896, *Cleburne* (N); damp underbrush, Darlington Gulch, June 3, 1909, *Willits 67* (Ry).

UTAH: Uinta National Forest, alt. 7000–9000 ft., July 14, 1913, *Barnett 114* (US); north slope, Uinta National Forest, alt. 7800 ft., July 14, 1913, *Bowen 1* (US); low moist ground, Alta, summit of Parley's Cañon, alt. 7600 ft., June 27, 1892, *Cleburne* (N); moist ravine, near Alta Summit, Utah Central Railway, Parley's Cañon, alt. 6600 ft., June 27, 1896, *Cleburne* (N); Weber Cañon, July 31, 1875, *Cleburne 1020* (N); Red Butte, Salt Lake City and vicinity, June 26, 1908, *Clemens* (G); Wasatch Mountains, 1908, *Clos 122* (US); stream-side, Puffers Lake, Beaver Co., alt. 10,000 ft., June 26, 1928, *Cottam 3490* (F); stream-side, Summit Co., alt. 9000 ft., July 12, 1928, *Cottam 3754* (CAS); Cottonwood Canyon, Salt Lake, June 27, 1918, *Eastwood 7764* (CAS); Mt. Timpanogos, Wasatch Range, June 15, 1933, *Eastwood & Howell 481* (G, CAS, NY); Pioneer Ranger Station, Fillmore Forest, Sevier Co., alt. 2700 m., July 12, 1917, *Eggleston 13883* (US); Big Cottonwood Canyon, Salt Lake Co., July 22, 1905, *Garrett 1516* (NY); Red Butte Canyon, Salt Lake Co., July 2, 1907, *Garrett 2145* (NY); Emigration Canyon, Salt Lake Co., June 14, 1913, *Garrett 2717* (F, G, NY); Big Cottonwood Canyon, Salt Lake Co., June 8, 1920, *Garrett 2909* (F, NY); City Creek Canyon, Salt Lake Co., June 20, 1923, *Garrett 3035* (G, NY); Hidden Lake Meadow, Utah Co., Aug. 13, 1925, *Garrett 3473* (Ry); Mt. Timpanogos, Utah Co., Aug. 2, 1925, *Garrett 3967* (F); Mt. Timpanogos, Wasatch Mountains, Utah Co., June 12, 1932, *Garrett 6187* (F); Lamb's Canyon, Wasatch Mountains, Salt Lake Co., June 28, 1933, *Garrett 6355* (F); Lamb's Canyon, Salt Lake Co., May 12, 1934, *Garrett 6561* (F); Lamb's Canyon, Salt Lake Co., June 19, 1934, *Garrett 6578* (F); wet places, Mt. Nebo, June 13, 1902, *Goodding 1145* (Ry); in aspen grove, near Bear River, Summit

Co., alt. 2460 m., June 20, 1931, *Goodman 1883* (NY, G, US, M); on aspen slope, east side of Wolf Creek Pass, alt. 9000 ft., June 16, 1933, *Graham 8141* (W, M, Carnegie); under aspens, head of Horse Creek, southwest of Strawberry Reservoir, alt. 7800 ft., June 17, 1935, *Graham 9228* (W, M, Carnegie); dry slopes aspen grove, Timpanogos Canyon, Utah Co., alt. 6800 ft., Sept. 16, 1932, *Harrison 5805* (M); Marysvale, Piute Co., alt. 9000 ft., June 15, 1899, *Jones* (G); Alta, alt. 8500 ft., July 7, 1910, *Jones* (G); Provo, alt. 8000 ft., July 3, 1894, *Jones 5585* (UCal, M, G, US, Ry, NY); Parley's Cañon, alt. 8000 ft., July 1, 1898, *Jones 6471* (US, M); Mill Creek Canyon, July 31, 1884, *Leonard* (K, NY, UCal); on rocks by clear creek, between Cove Fort and Sevier, Sevier Co., alt. 6500 ft., May 9, 1934, *McKelvey 4243* (G); pasture, Moroni Ranger Station, Uinta National Forest, alt. 8950 ft., July 16, 1913, *Ollerton 200* (US); aspen groves, Goodman Ranch, Summit Co., alt. 7900 ft., June 30, 1926, *Payson & Payson 4830* (UCal, Ry, ANS, P, G, US, NY, M); common on somewhat dry slopes near West Fork of Bear River, Uinta Mountains, Summit Co., alt. 9700 ft., July 8, 1920, *Payson & Payson 4927* (UCal, P, M, G, US, Ry, ANS, NY); Uinta Forest Reserve, June 28, 1905, *Potter* (US); Red Rock Cañon, near Salt Lake City, June 11, 1905, *Rydberg 6098* (NY); around and below Twin Lakes, Big Cottonwood Cañon, July 7, 1905, *Rydberg 6743* (NY); headwaters of Little Cottonwood Creek, above Alta, July 10, 1905, *Rydberg 6863* (NY, G); Big Cottonwood Cañon, below Silver Lake, June 27, 1905, *Rydberg & Carlton 6347* (NY); Big Cottonwood Cañon, below Silver Lake, June 29, 1905, *Rydberg & Carlton 6442* (US, NY, Ry); Big Cottonwood Cañon, below Silver Lake, June 29, 1905, *Rydberg & Carlton 6480* (NY); Big Cottonwood Cañon, around Lake Solitude, June 30, 1905, *Rydberg & Carlton 6516* (US, Ry, NY); Manti Forest, alt. 9500 ft., *Sampson* (US); Emigration Cañon, Salt Lake Co., July 17, 1909, *Smith 1846* (Ry, U); aspen thicket, Spring Hollow, Logan Canyon, Cache Co., alt. 7500 ft., June 28, 1910, *Smith 2216* (G, NY, U, Ry); limestone, crossing mountain from Cove Fort east on Clear Brook Stream, Fish Lake National Forest, alt. 6500 ft., May 9, 1934, *Stone 204 in part* (NY); spruce zone, Ephraim Cañon, Wasatch Mountains, alt. 2700 m., Aug. 27, 1907, *Tidestrom 343* (US); abundant in spruce zone, Twelve Mile Cañon, Wasatch Mountains, July 10, 1908, *Tidestrom 1482* (US); cañon south of Glenwood, alt. 7000 ft., June 12, 1875, *Ward 202* (M, F, G, US, ANS); slope of Aquarius Plateau, alt. 8800 ft., Aug. 22, 1875, *Ward 716* (US, M, F, ANS); Parley's Park, alt. 7000 ft., June 1869, *Watson 843* (US); damp sandy loam, aspen area, north slope Fish Creek, Manti Forest, alt. 8850 ft., July 20, 1912, *Willey 179* (U).

8b. **Mertensia arizonica** var. **Grahami**, var. nov.[1]

Corolla smaller than in the species, tube 4–6 mm. long, glabrous at the base, limb 5–7 mm. long; insertion of filaments lower in the tube, about 1.5 mm. long; anthers about 3 mm.

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[1] **Mertensia arizonica** var. **Grahami**, var. nov., *M. arizonicae* similis; corollae tubo 4–6 mm. longo, basi glabro; corollae limbo 5–7 mm. longo; antheris ca. 3 mm. longis; calyce 3–4 mm. longo, in fructu usque ad 10 mm. longo, triangulari-acuto; nuculeis 4–5 mm. longis, rugosis.

long, base reaching down to the fornices; calyx 3–4 mm. long in anthesis, the triangular acute lobes half as long, becoming much enlarged in fruit, up to 10 mm. long, the lobes longer than the tube; nutlets 4–5 mm. long, slightly rugose.

Distribution: Garfield and probably Rio Blanco Co., Colorado.

COLORADO: at head of Ute Trail, Roan Mountains, July 8, 1922, *Cockerell* (US); canyon at head of west fork of Douglas Creek, Garfield Co., alt. 7700 ft., July 16, 1935, *Graham 9667* (M TYPE, Carnegie, W).

8c. Mertensia arizonica var. **subnuda** (Macbr.), comb. nov.
M. toyabensis var. *subnuda* Macbr. in Contr. Gray Herb. N. S. No. 48: 7. 1916.

Leaves short-strigose on the upper surface, glabrous or sparingly hairy on the lower surface; calyx-lobes divided almost to the base, glabrous on the back or sparingly pubescent, ciliate; anthers 2–2.5 mm. long.

Distribution: Sevier Co., Utah, to White Pine Co., Nevada.

UTAH: Deer Creek, July 29, 1880, *Jones* (G); gravel, Fish Lake, Aug. 10, 1894, *Jones 5801* (M, US, P); Fish Lake Forest, crossing mountain from Cove Fort east on Clear Brook stream, May 9, 1934, *Stone 204 in part* (NY); Fish Lake Mountain, July 8, 1875, *Ward 329* (M, G TYPE, US); Fish Lake Mountain, July 8, 1875, *Ward 338* (US, F).

NEVADA: Snake Creek, Snake Mountains, July 6, 1928, *Jaeger* (G).

The type of *Mertensia arizonica* bears the label "Arizona," but the specimens were collected probably in southwestern Utah.

Mertensia arizonica and its var. *Leonardi* are easily separated in their typical form but a few intermediate forms are hard to place. The var. *Grahami* is closely related to the species and to var. *Leonardi,* but by reason of the smaller flowers, attachment and position of the stamens, and structure of the calyx, is distinct. It is also disjunct in range.

The specimens referred to var. *subnuda* are quite variable as to character of pubescence, but show close affinity to *Mertensia arizonica* var. *Leonardi,* differing mainly in the pubescence. The specimen from Nevada has the calyx less deeply divided than the others.

9. **Mertensia mexicana,** sp. nov.[1]

Erect (?), probably 8 dm. or more tall; basal leaves unknown; cauline leaves elliptical, 4–12 cm. long, 1.5–4 cm. broad, acute or obtuse, the lowermost petiolate, the upper sessile, glabrous, papillate below, pustulate above, obscurely ciliate; inflorescence axillary, diffuse and multiflorous, the peduncles much elongated (at least in age), bearing many flowers in a modified scorpioid cyme; pedicels 5–20 mm. long, glabrous to sparsely scabrous; calyx 3–4 mm. long in flower, becoming much enlarged in fruit, up to 9 mm. long, divided almost to the base, the lobes lanceolate, obtuse or acutish, short-ciliate, glabrous outside, strigose within; corolla-tube 6–7 mm. long, the glands at the base well developed and sparsely pubescent; corolla-limb 8–9 mm. long, longer than the tube, only moderately expanded; anthers 2–2.5 mm. long, shorter and about as broad as the filaments; filaments 3–3.5 mm. long; fornices prominent, glabrous; style 13–15 mm. long, about as long as the corolla; nutlets 3–4 mm. long, rugose dorsally.

Distribution: known only from the type locality.

MEXICO: road to Porral, near San Julian, State of Chihuahua, alt. 7000–8000 ft., Sept. 8, 1898, *Nelson 4931* (US TYPE, G).

Notwithstanding the remoteness of this species from *M. arizonica* var. *Leonardi* and *M. arizonica* it is closely related to them. The first thing to which attention is called on seeing the plant is the tremendous number of flowers in comparison to the above-mentioned entities. The calyx is similar to that of var. *Leonardi* in form but it is smaller, with the lobes inclined to be more obtuse. The ring of hair which is usually present at the base of the corolla-tube in *M. arizonica* and var. *Leonardi* is represented by some rather inconspicuous hairs on the basal glands. The fornices also lack pubescence. The anthers are slightly shorter than in *arizonica* and about the same as in var. *Leonardi.*

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[1] **M. mexicana** sp. nov., erecta, 8 dm. vel plus alta; foliis caulinis ellipticis, 4–12 cm. longis, 1.5–4 cm. latis, acutis vel obtusis, glabris, obscure ciliatis; inflorescentiis axillaribus, diffusis et multifloris; pedicellis 5–20 mm. longis, glabris vel scabris; calyce 3–4 mm. longo, in fructu usque ad 9 mm. longo; calycis lobis lanceolatis, obtusis vel acutis, breviter ciliatis, glabris; corollae tubo 6–7 mm. longo; corollae limbo 8–9 mm. longo, tubum superanto; antheris 2–2.5 mm. longis; filamentis 3–3.5 mm. longis; nuculeis 3–4 mm. longis, rugosis.

This species is based on but one collection, the specimens of which are not complete and past the best stage of development. More material may disclose other differences.

10. Mertensia campanulata A. Nels. in Bot. Gaz. **54**: 150. 1912.

Erect, 3–8 dm. tall, stems from each rootstalk 1 to few; basal leaves very large in contrast to the cauline leaves, 10–20 cm. long, 2–8 cm. broad, ovate-oblong to oblong-lanceolate, acute or possibly somewhat acuminate, the base decurrent on the petiole, glabrous except the margins sparingly short-strigose, upper surface papillate, petiole 10–20 cm. long; cauline leaves diminishing rapidly in size from base to top of plant, 2–20 cm. long, 0.7–5 cm. broad, ovate to narrowly oblong-lanceolate, acute, acuminate, or obtuse, the lowest petiolate, the rest sessile, glabrous, the upper surface pustulate, the margins rarely developing hairs, more or less glaucous; pedicels 1–10 mm. long, glabrous, glaucous, stout; inflorescence usually much branched, the peduncles bearing a more or less elongated scorpioid cyme; calyx campanulate, 5–7 mm. long, glabrous, lobes short-obtuse, 1–2 mm. long, margins merely pustulate, inner surface of calyx with a few short hairs; corolla-tube 7–10 mm. long, glabrous within; corolla-limb 7–8 mm. long, only moderately expanded, subequal to the tube; anthers 2.5–3.5 mm. long, about as long as or longer than and as wide as or wider than the filaments; fornices inconspicuous, merely a thickening in the tissue; style about the length of the corolla or a little longer; nutlets rugose, about 5 mm. long.

Distribution: Blaine and Camas Counties, Idaho.

IDAHO: near Ketchem, Custer Co. [now Blaine Co.], June 19, 1930, *Applegate 6326* (G); prairie and dry places along roads, Corral, Blaine Co., alt. 5700 ft., June 27, 1916, *Macbride & Payson 2907* (NY, G, Ry, US, M, CAS, UCal); edge of meadow, Alturas Lake, Blaine Co., alt. 6400 ft., Aug. 11, 1916, *Macbride & Payson 3724* (NY, G, Ry, US, M); on moist flat near Alturas Lake, July 12, 1910, *M'Cain* (Ry); Sawtooth National Forest, coll. of 1910, *Woods 230* (Ry); moderately moist meadows, Hailey, Blaine Co., July, 1911, *Woods 328* (G, Ry TYPE).

A conspicuously and well-marked species by reason of the calyx and the stem-leaves which become rapidly reduced upward. A note by the collector attached to one of the type sheets indicated that this species does not grow in such rank stands as does *M. ciliata* nor is it so leafy. The peculiar campanulate calyx finds its nearest approach in *M. arizonica* among the American species. In Siberia it has a close counterpart in *M. serrulata* (Turcz.) DC., as to calyx development. By a

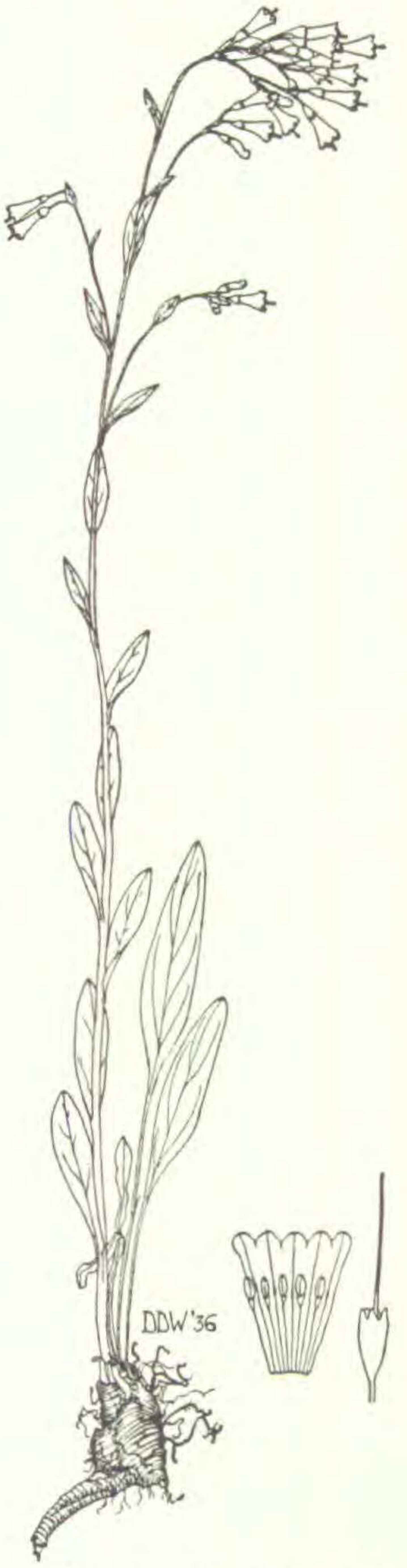

Fig. 5. *M. campanulata.* Habit sketch × 1/6; enlarged flower × 2/3.

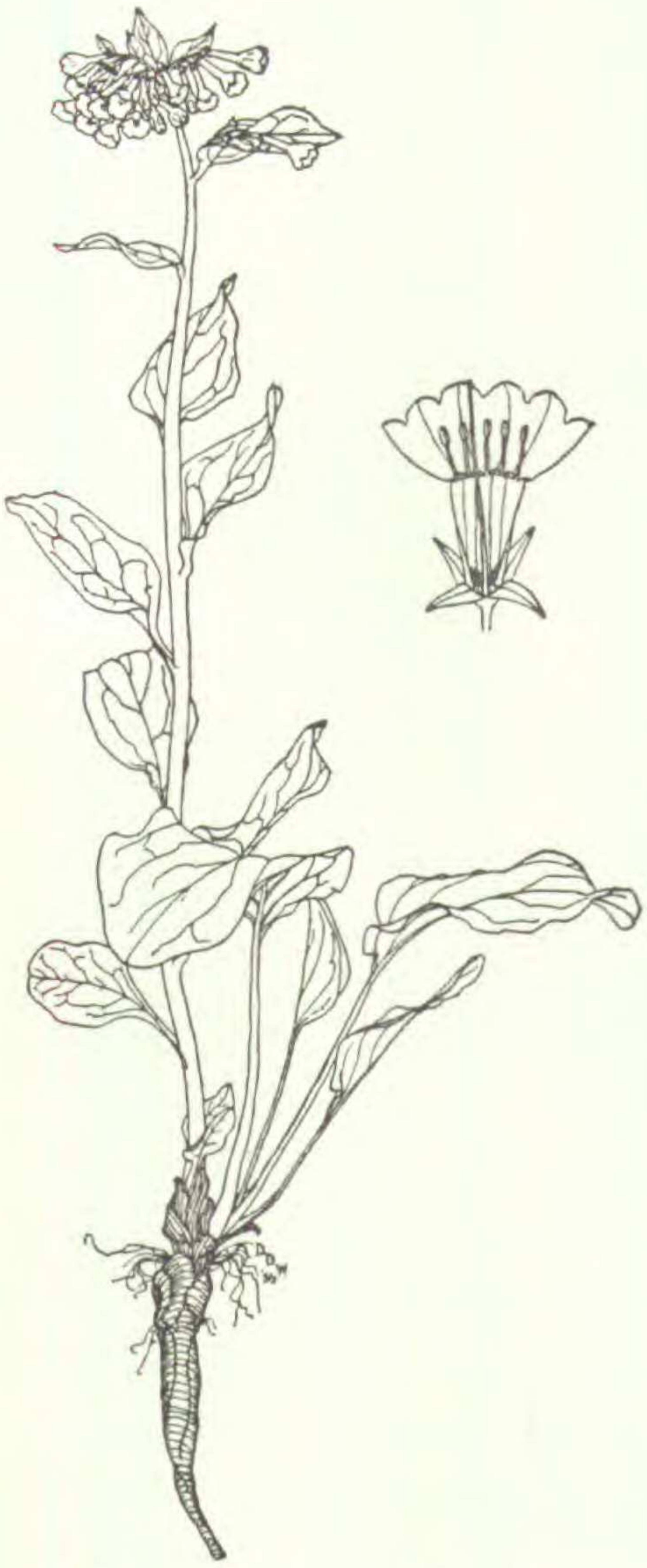

Fig. 6. *M. virginica.* Habit sketch × 1/6; flower × 2/3.

typographical error the number of the type was given as *Woods 325* in the original publication. It should have read *Woods 328*.

11. **Mertensia virginica** (L.) Pers. ex Link, Handb. **1**: 580. 1829.

M. pulmonarioides Roth, Cat. Bot. **1**: 34. 1797.
Pulmonaria virginica L., Sp. Pl. 135. 1753.
? P. canadensis Yong, Cat. 44. 1783, *nomen subnudum*.
? P. glabra Stokes, Bot. Mat. Med. **1**: 282. 1812.
Pneumaria virginica Hill, Veg. Syst. **7**: 40. 1764.
Lithospermum pulchrum Lehm., Asperif. pars 2: 290. 1818.
Casselia virginica Dumort., Com. Bot. 24. 1822.
Steenhamera virginica Kosteletzky, Allg. Med. Pharm. Fl. **3**: 838. 1834.
Steenhammera virginica Turcz. in Bull. Soc. Nat. Moscow **14**: 244. 1840.
Hippoglossum virginicum Lilja in Linnaea **17**: 111. 1843.
Cerinthodes virginicum O. Kuntze, Rev. Gen. Pl. pt. 2: 436. 1891.

Stems erect, 1–7 dm. tall, one to several from a thick ligneous root; basal leaves of flowering stems relatively small, the surculose leaves larger, 4–20 cm. long, 2–12 cm. broad, broadly ovate to elliptic, glabrous or usually slightly papillate above, long-petiolate; middle cauline leaves broadly ovate to elliptic-oblong, 4–12 cm. long, 2–9 cm. broad, short-petiolate to sessile, glabrous, the upper leaves reduced, sessile and semiamplexicaul, all leaves pinnately veined; inflorescence borne on peduncles, usually from the axils of leaves, flowers in unilateral or scorpioid cymes, congested at first, much elongated in age; pedicels 3–10 mm. long; calyx 2–10 mm. long (mostly about 3 mm. long), divided almost to the base, the lanceolate to oblong-lanceolate lobes obtuse or acute, accrescent; corolla blue, occasionally white or pinkish, tube 11–21 mm. long (mostly 13–16 mm. long), with a dense ring of hairs at the base within, the limb 7–13 mm. long (mostly 8–10 mm. long), abruptly expanded, campanulate; fornices present but usually inconspicuous; anthers linear-oblong, 1.2–1.7 mm. long; filaments slender, not expanded, 4–8 mm. long; style usually reaching or surpassing the anthers; nutlets about 3 mm. long, rugose on all sides at maturity; gynobase separating the two pairs of nutlets well intruded.

Distribution: New York, Ontario, Wisconsin, and Iowa south, on the east to New Jersey, Delaware, Virginia, Tennessee; on the west to eastern Kansas (Miami Co.), Missouri, and Alabama (Tuscaloosa Co.).

ONTARIO: St. Thomas, May 29, 1904, *Fisher* (ANS); Glen Elgin, Lincoln Co., May 13, 1897, *McCalla 445* (Cl).

NEW YORK: Port Dickinson, Broome Co., coll. of 1895, *Clute* (NY); rich alluvial soil, Negundo Woods, Ithaca, May 8, 1884, *Coville* (US); in alluvium along Enfield Creek below gorge, Ithaca, Tompkins Co., May 10, 1914, *Davis 3058* (Cl, G); flats of stream, near Honeoye Junction, Caledonia, Livingston Co., June 2, 1917, *Eames 8677* (Cl); on banks of Oneida Creek, Durhamville, Oneida Co., May 24, 1920, *House 6920* (Ry, Clokey); East Aurora, May 15, 1926, *Johnson* (NY); along the Chemung River, Chemung Co., fl. May 12, 1897, fr. June 10, 1897, *Lucy 1202* (Ry, F); Genesee River flats, May 14, 1922, *Matthews 2085* (UM); in alluvial soil, along creek bank, Oneida, May 2, 1896, *Maxon* (US, NY); alluvial soil, Ellis Hollow, Ithaca, May 30, 1920, *Muenscher & Bechtel 339* (US, Clokey); alluvial soil south of Chenango River, Chenango Co., June 18, 1924, *Muenscher, Wilson & Foster 15899* (Cl); Ellis Hollow, May 6, 1889, *Norris* (M); Collins, Erie Co., April 15, 1921, and May 16, 1921, *Perkins* (G); in sandy soil along the inlet northwest of Buttermilk Creek, Ithaca, May 8, 1914, *Rodman & Metcalfe 3057* (G); Taughannock Ravine, Ithaca, May 14, 1892, *von Schrenk* (M); Negundo Woods, Ithaca, April 25, 1878, *Trelease* (M); alluvial soil along Cascadilla Creek, Ellis Hollow, Dryden, Tompkins Co., April 25, 1915, *Wiegand 4865* (Cl).

NEW JERSEY: Raritan, May 6, 1886, *Apgar* (NY); Burnt Mills, May, 1889, *Perry* (M).

PENNSYLVANIA: pasture, Sayre, May 4, 1899, *Barbour 613* (Ry); along creek, Millersville, April 30, 1894, *Bitner 2213* (Ry); Peach Bottom, Lancaster Co., April 9, 1910, *Carter* (NY); Corry, May 7, 1896, *Churchill* (US, G, M); Little Conestoga, May 17, 1895, *Eisenhower* (M); low, moist ground, east bank of Schuylkill River, Perkiomen Junction, Montgomery Co., May 4, 1930, *Fogg 4056* (G); banks of Little Conestoga, Lancaster Co., April 28, 1890, *Heller* (US); between York Furnace and Tucquan, Lancaster Co., May 11, 1901, *Heller* (US, G, F); Safe Harbor, Lancaster Co., April 29, 1893, *Heller & Halbach 1325* (US, G, M, NY); foot of moist, wooded slopes, Perkiomen Creek above Graters Ford, Perkiomen Township, Montgomery Co., April 21, 1915, *Long & St. John 2448* (G); Westown Farm, Butternut Island, Chester Co., April 25, 1905, *Moon 25* (US); Union Co., *Noll* (US); banks of the Schuylkill near Conshohoken, April 23–26, 1865, *Parker* (M, F); meadow, near West Chester, May 9, 1882, *Redfield* (M); Moore Township in Stoops Ferry, Allegheny Co., May 7, 1901, *Shafer 314* (Cl); 2 miles north of Wrightsville, York Co., May 2, 1891, *Small* (F); vicinity of Lancaster, May, 1892, *Small* (NY); meadow, Brandywine Creek, Shaw's Bridge, Chester Co., April 26, 1930, *Stone* (G); Williamsport, Lycoming Co., May 25, 1920, *Young* (Cl).

DELAWARE: Mount Cuba, May 10, 1896, *Albrecht* (NY); meadows near Wilmington, May, 1893, *Canby* (P); Centerville, fl. April 20, 1866, fr. June 2, 1866, *Commons* (NY); alluvial soil along Red Clay Creek, Mount Cuba, fl. April 29, 1897, fr. May 8, 1897, *Commons* (NY); meadows, Mount Cuba, May 7, 1893, *MacElwee 1361* (F); Grand Tower, May 1, 1910, *Williamson* (ANS); Mount Cuba, May 1, 1910, *Williamson* (ANS).

MARYLAND: open rocky woods, near Washington D. C., April 10, 1914, *Batchelder* (NY); Lock Raven, April 6, 1906, *Conard 552* (AM); a full acre of this plant on Cayuta Creek, April 10, 1888, *Millspaugh* (US); river bank, Montgomery Co., April, 1897, *Morris* (F); Cumberland, April, 1906, *Perdew* (AM); High Island, Potomac River, April 28, 1881, *Smith* (US, G); flats at upper end, Plummer's Island, in the Potomac River, near Cabin John, Montgomery Co., April 15, 1915, *Standley 11268* (G); Great Falls, Montgomery Co., April 30, 1889, *Sudworth* (M); Plummer's Island, in the Potomac River, near Cabin John, Montgomery Co., April 15, 1915, *Van Eseltine 265* (G); rich soil near a stream, Gunpowder River, May 13, 1894, *Waters* (US).

DISTRICT OF COLUMBIA: High Island, April 24, 1881, *Comstock* (Cl); vicinity of Washington D. C., April 11, 1897, *Kearney* (NY); Plummer's Island, April 23, 1897, *Kearney* (Cl); low grounds, banks of the Potomac, May 10, 1877, *Morong* (M, NY); banks of canal, April 21, 1895, *Pollard 78* (UCal); Rock Creek, April 18, 1897, *Williams* (Ry); banks of Potomac above Washington D. C., April 21, 1908, *Williamson* (ANS).

VIRGINIA: Richmond, April 24, 1924, *Benke 3699* (F); Bedford Co., April 30, 1871, *Curtiss* (G); near Miller School, Alb Co., April 20, 1888, *Finsley* (AM); Battlefield Winchester, April 29, 1896, *Gray 364* (G); alluvial bottoms, near Dead River, Virginia shore of Potomac River, April 19, 1902, *Morris 1463* (AM); woods, Front Royal, Warren Co., April 20, 1912, *Wiegand* (Cl).

ALABAMA: alluvial banks of Rock Creek, in southwestern part of Colbert Co., March 29, 1935, *Harper 3313* (M); moist rocky ground, along small creek, near Black Warrior River, Tuscaloosa Co., April 15, 1929, *Palmer 35376* (M).

OHIO: Columbus, May 8, 1897, *Clevenger* (US); Granville, coll. of 1903, *Condit* (UCal); O. S. U. Island, Franklin Co., May, 1889, *Craig 6014* (Cl); Oberlin, Lorain Co., May 13, 1894, *Dick* (G); swampy ground, banks of Grand River near Soda Ash Plant, Painesville, Lake Co., May 8, 1916, *Douglas* (Cl); wet ground, bank of Kellogg Creek, Painesville, Lake Co., May 19, 1916, *Douglas* (Cl); damp grounds, Bennett's Woods, Carlisle, Lorain Co., May 3, 1902, *Grover & Booth* (UM); Granville, April 18, 1890, *Jones 1323* (Ry); river bottoms, Oberlin, Lorain Co., May 8, 1891, *Kofoid* (Cl); Big Darby, May, 1909, *Mayferth* (UM); Oberlin, Lorain Co., April 28, 1894, *Ricksecker* (US); Fernbank, "North Bend," coll. of 1854, *Short* (UCal); moist woods, Stoney Point, Sedansville, May 5, 1931, *Stephenson* (Ry); Chillicothe, May, 1885, *Wallace 744* (US); Berea, Cuyahoga Co., May, 1897, *Watson* (F); alluvial soil, Garrettsville, Portage Co., April 26, 1908, *Webb* (G).

WEST VIRGINIA: moist hillside near Guyandotte River, Cabell Co., April 6, 1928, *Gilbert 38* (G); Wheeling, April 13, 1878, *Mertz* (NY); rich woods, Morgantown, Monongalia Co., April 11, 1890, *Millspaugh* (NY); near Hampton, Upshur County, April 21, 1895, *Pollock* (P).

MICHIGAN: Ross, Kent Co., May 7, 1889, *Sones* (P).

INDIANA: Honey Creek, Terre Haute, April 17, 1889, *Evermann* (US); Knox

Co., April 23, and May, 1890, *Spillman 360* (P); Crawfordsville, May, 1896, *Thompson* (F); Happy Valley, Hanover, March 20, *Williams 114* (G); Mattsville, May 5, 1892, *Wilson* (NY).

KENTUCKY: Elklick, Fayette Co., March 26, 1927, *Anderson 392* (G); Shelbyville, coll. of 1917, *Flint* (G); rich damp banks in woods, Burgin, Mercer Co., *King 29* (F); moist woods, Bowling Green, April, 1892, *Price* (M); Elkhorn Cliff, farm W. Carlton, Stamping Ground, March 10, 1930, *Singer 16* (US); coll. of 1842, *Short* (US).

TENNESSEE: Sherwood, coll. of 1886-87, *Bridgman* (UCal); rich, wooded banks, Emory River, April 23, 1893, *Kearney 133* (US); to French Broad River above Dandridge, March, 1842, *Rugel* (NY, M); very wet grounds, near Knoxville, April, 1896, *Ruth* (M); low, damp grounds, Harriman, May 1, 1896, *Ruth 147* (G); low wet grounds, Dante, April, 1897, *Ruth 3236* (NY).

WISCONSIN: Kickapoo River bottoms, Ontario, Vernon Co., May 9, 1931, *Fassett & Truman 13034* (M); May 22, 1888, *Scoville* (Ry).

ILLINOIS: alluvial river banks, Dekalb Co., May, *Abbott* (CAS); Riverside, May 10, 1911, *Babcock* (NY); Utica, May 16, 1916, *Benke 1775* (CAS, US); rich woods near Wady Petra, May 4, 1898, *Chase* (US, AM); moist clearing, near Monica, Peoria Co., April 28, 1907, *Chase 1282* (US); Macon Co., April, 1896, *Clokey 227* (Clokey); Rossville, May 2, 1885, *DeForest 364G* (Cl); 3 miles south of Columbia, April 22, 1922, *Drushel 1904* (M); French Village, April 24, 1877, *Eggert* (UCal, M, NY, Ry); Vermilion River, south of Hillery, Vermilion Co., April 27, 1907, *Gates 1407* (US); Decatur, May 8, 1897, *Gleason* (G); rich mesophytic hillsides, Grand Tower, May 5, 1902, *Gleason 2579* (G); in clearing, Starved Rock, La Salle Co., June 1–7, 1909, *Greenman, Lansing & Dixon 100* (NY, G); Peoria, May, 1884, *Heading 2109* (UCal); woods along Des Plaines River, north of Thatcher's Park, May 14, and 26, 1900, *Hill 1280, 1312* (ANS, M); low open woods along stream near Hickory Creek, New Lenox, May 8, 1915, *Johnson 1639* (NY); rich woods, Peoria, May, 1900, *McDonald* (Ry); Augusta, *Mead* (ANS, G); low rich ground, Johnson Co., April 28, 1919, *Palmer 14987* (M); rich woods, 1¼ miles north of ''Cottonwood'' Station, Urbana, April 24, 1909, *Pease 11835* (G); Kinkade's Woods, Richland Co., May 2, 1926, *Ridgway 2485, 2486, 2487* (M); moist woods, Evanston, coll. of 1879, *Shipman* (ANS); rich woods, Wheatland, April 19, 1896, *Umbach* (US, ANS).

IOWA: 4 miles west of Grinnell, Sugar Creek, May 11, 1907, *Conard 626* (AM); Indianola, May 20, 1885, *Elrod* (UM); Fayette Co., May 28, 1894, *Fink 100* (US, G); Johnston Co., April 28, 1895, *Fitzpatrick & Fitzpatrick* (M, G); rich open woods, Johnston Co., May 11, 1900, *Fitzpatrick & Fitzpatrick* (Cl); rich ground in shade, vicinity of Bentonsport, April, 1930, *Graves 1740* (CAS, M); Iowa City, coll. of 1889, *Hitchcock* (M); Grinnell, coll. of 1876, *Jones* (G); wet woods, Poweshiek Co., June, 1876, *Jones* (CAS); Grinnell, May 7, 1877, *Jones* (NY, Ry); near Grinnell, coll. of 1886, *Norris* (M); rich woods along base of river bluff, near Farmington, Van Buren Co., May 19, 1929, *Palmer 35851* (G); Ames, May 25, 1890, *Raymond* (M); rich woods, Davenport, May 10, 1891, *Ross* (UCal); Iowa City, May 13, 1883, *Shimek* (US); Cou Falls, May 15, 1909, *Somes 3023* (US); Ames, *Stewart 293* (Cl); Scott Co., May 18, 1873, *Suksdorf* (P).

MISSOURI: low grounds, Cass Co., April 30, 1864, *Broadhead* (M); Independence, April 10, 1895, *Bush 365* (M); common in rich woods, Adams Station, April 25, 1897, *Bush 398* (US); along streams, Swan, April 21, 1907, *Bush 4238* (M);

rich bottoms, Monteer, April 28, 1907, *Bush 4374* (M); bottoms, Morgan Co., April 13, 1935, *Bush 14544* (M); banks of streams, Eolia, Pike Co., April 23, 1917, *Davis* (Clokey, Cl); dry open woods, Davis farm, near Whiteside, Lincoln Co., May 19, 1917, *Davis 7296* (M); Jerome, April 22, 1923, *Drushel 1705* (M); near Mincke, April 21, 1918, *Drushel 4065* (M); bridge across Big River, near junction with Flat River, St. Francois Co., April 7, 1929, *Greenman* (M); rich woods, local, Jackson Co., April 25, 1897, *Mackenzie* (M); low rich woods, Galena, Stone Co., May 20, 1914, *Palmer 5656* (M, Cl); wet rocky ground along Stout's Creek, near Arcadia, Iron Co., May 27, 1926, *Palmer 30239* (M); rich shaded ground at foot of bluff, Mine La Motte, Madison Co., April 29, 1931, *Palmer 39154* (G, M); shaded woods, alluvial soil, Irondale, Washington Co., April 15, 1898, *Russell* (M); in shaded ground at base of limestone hill along Big River, 5 miles north of House Springs, Jefferson Co., April 18, 1931, *Steyermark 550* (M); Glencoe, April 27, 1888, *Trelease* (M); moist alluvial bank of a small creek 15 miles southwest of St. Louis, St. Louis Co., April 21, 1934, *Williams 1500* (M, W); Hillsboro, May 24, 1885, *Wislizenus 315* (M).

KANSAS: Miami Co., April, 1885, *Oyster* (CAS); woods, Miami Co., May, 1883, *Oyster 5856* (P).

Mertensia virginica is possibly one of the oldest species of the genus found on our continent. Within its range are the oldest available land areas of the continent. The distinction of occurring on these old land masses is not shared with any other species. Neither does it share with most other species of the genus the complex variations which make the definition of entities so difficult. No close specific relationship between this species and any other is readily suggested. If it were necessary to show relationship, *M. ciliata* and its varieties probably are more closely allied than any other.

The author is indebted to Mr. J. Ramsbottom and Mr. A. H. G. Alston, of the British Museum of Natural History, who kindly have made a comparison of material sent them *(Williams 1500)* with Linnaeus' specimen in the Linnean Herbarium. The type is marked "virginica" and "K" (i.e. Kalm) in Linnaeus' hand. Kalm collected in Pennsylvania, New York, New Jersey, and Canada.

12. **Mertensia ciliata** (James) G. Don, Gen. Hist. **4**: 372. 1838.

M. polyphylla Greene, Pittonia **4**: 87. 1899.
M. punctata Greene, *l.c.* 88.
M. ciliata var. *longipedunculata* A. Nels. in Bull. Torr. Bot. Club **29**: 402. 1902.
M. picta Rydb. in Bull. Torr. Bot. Club **31**: 638. 1904.

M. ciliata polyphylla A. Nels. in Coult. & Nels., Man. Ry. Mt. Bot. 421. 1909.

M. ciliata punctata A. Nels., *l.c.*

M. pallida Rydb. in Bull. Torr. Bot. Club **36**: 680. 1909.

M. incongruens Macbr. & Payson in Contr. Gray Herb. N. S. No. 49: 66. 1917.

Pulmonaria ciliata James in Trans. Am. Phil. Soc. II. **2**: 176. 1825, name only; Torr. in Ann. Lyc. N. Y. **2**: 224. 1828.

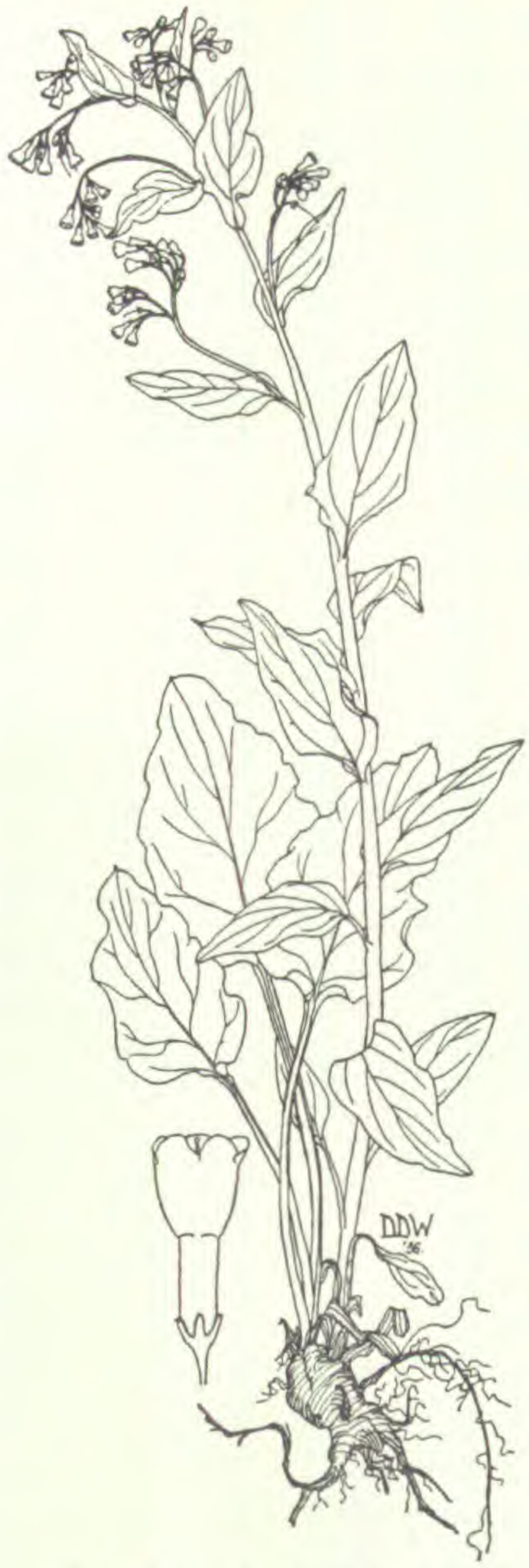

Fig. 7. *M. ciliata.* Habit sketch × ⅙; enlarged flower × 1.

Erect or ascending, 1–12 dm. tall, usually with many stems from each rootstalk; basal leaves variable, oblong- to ovate- or lanceolate-subcordate, 4–15 cm. long, 3–10 cm. broad, ciliate on the margins, often papillate on the upper surface, petioles longer or shorter than the blades; cauline leaves lanceolate to ovate, acute, acuminate or obtuse at the apex, attenuate to subcordate at the base, the lowermost short-petiolate, the uppermost sessile, ciliate on the margins, often papillate on the upper surface (the papillae often mucronate on the uppermost leaves), often quite glaucous, thin in texture; pedicels 1–10 mm. long, glabrous, papillose or rarely with a few short strigose hairs; inflorescence from the axils of leaves, the peduncles elongated in mature or well-developed plants, in young plants the flowers aggregated at the top of the plant, each peduncle terminated in a modified ebracteate scorpioid cyme, or occasionally subumbellate; calyx-lobes 1.5–3 mm. long, glabrous on the back, ciliate to papillate on the margins, more or less strigose within, obtuse or rarely somewhat acute, divided almost or quite to the base, rarely enlarged in fruit; corolla-tube 6–8 mm. long (mostly about 7 mm.), glabrous or with crisped hairs within; corolla-limb 4–10 mm. long (mostly about 6 mm.), sometimes longer than the tube, moderately expanded; anthers 1–2.5 mm. long (mostly about 2 mm.), as long as or shorter, and narrower, than the expanded part of the filament; fornices prominent, glabrous, papillate or pubescent; style about as long as the corolla or exceeding it; nutlets rugose or mammillate.

Distribution: cosmopolitan in moist hills and foothills and up to about 12,000 feet elevation in the mountains from Montana, Colorado, and Wyoming, to eastern Oregon, south to northern New Mexico.

MONTANA: along streams, Mt. Bridger, alt. 6000 ft., July 17, 1905, *Blankinship 376* (US, UM, M, ANS); Helena, June 25, 1908, *Butler 751* (NY); Deer Lodge National Forest, Aug. 13, 1911, *Fleming 91* (US); Spanish Basin, Madison Range, July 11, 1896, alt. 6000 ft., *Flodman 751* (NY); Stillwater Co., alt. 1600–2400 m., July, 1920, *Kemp 41* (NY); Lima, June 28, 1895, *Rydberg 2777* (NY TYPE *M. pallida*); Spanish Basin, Gallatin Co., alt. 6500 ft., June 23, 1897, *Rydberg & Bessey 4876* (G); mountains, Lima, June 30, 1895, *Shear 3395* (US, NY); Hellroaring Plateau, Beartooth Forest, Rock Creek District, July 25, 1921, *Simms & Zeh 683* (UM); moist open hillside upper Hyalite Trail, Middle Creek Canyon, Gallatin Co., Aug. 3, 1927, *Swingle* (Ry); Belt Mountains, July 25, 1888, *Williams 130* (US).

WYOMING: Horse Creek, July 11, 1892, *Buffum 646* (Ry); moist hillside, Mt. Washburn, Yellowstone Park, alt. 9000 ft., July 3, 1931, *Condon 5766* (M); headwaters, Cliff Creek, alt. 9000 ft., Aug. 9–18, 1900, *Curtis* (NY); Heather Creek Ranger Station, Hayden Forest, Carbon Co., alt. 2300 m., July 4, 1915, *Eggleston 11260* (US); along streams, Clark's Fork and Big Horn Mountains, 1881–1882, *Forwood* (US); moist places, Wind River Mountains, July 24, 1881–1882, *Forwood* (US); wet hillside, Ten Sleep Lakes, Big Horn Co., July 30, 1901, *Goodding 409* (UCal, M, Cl); Coal Creek, Teton Mountains, alt. 8200 ft., on stony creek bank, Aug. 15, 1921, *Hall 11447* (G); Gros Ventre Pass, head of Pierre's Hole, alt. 7000 ft. (also on Madison River), June 18, 1860, *Hayden* (M); Lake Fork, alt. 5000 ft., June 22, 1860, *Hayden* (M); near head Bear Creek, Gray's River drainage, Wyoming Forest, July 10, 1914, *Jewell & Woods 69* (Ry); Sherman, alt. 8000 ft., Aug. 1, 1905, *Johnson 123* (NY); head of Swan Lake Valley, Yellowstone National Park, July 11, 1888, *Knowlton* (US); Uinta Mountains, Aug. 1872, *Leidy* (ANS); Uinta Mountains, Aug., 1873, *Leidy* (US); Sherman, alt. 8235 ft., July 27, 1884, *Letterman* (M); Apollinaris Spring, Yellowstone National Park, July 17, 1902, *Mearns 1939, 1940* (NY); Teton Mountains near Leigh Lake, July 26, 1901, *Merrill & Wilcox 1129* (NY, US, G, Ry);

North Chugwater, July 7, 1894, *Nelson 313* (Ry); Sybille Creek, July 8, 1894, *Nelson 408* (US, G, Ry, M, NY); Garfield Peak, July 29, 1894, *Nelson 689* (Ry); Union Pass, Aug. 13, 1894, *Nelson 1028* (US, Ry, Cl, M, G, NY); Union Peak, Aug. 13, 1894, *Nelson 1031* (Ry); Table Mountain, June, 1895, *Nelson 1392* (Ry); stream banks, Chug Creek, Albany Co., June 30, 1900, *Nelson 7321* (US, G, NY, O, Ry TYPE *M. ciliata* var. *longipedunculata*, M, C); on shaded creek banks, Nash's Fork, Albany Co., July 28, 1900, *Nelson 7752* (NY, US, G, M, Ry); wet banks, Little Goose Cañon, Sheridan Co., July 28, 1901, *Nelson 8531* (Ry); banks of streams, Centennial, Albany Co., July 27, 1902, *Nelson 8695* (US, NY, UCal, G, M, Ry, Cl); subalpine creek banks, Centennial, Albany Co., July 31, 1902, *Nelson 8723* (US, G, Ry, Cl, M); stream banks, Birds Eye, June 22, 1910, *Nelson 9422* (M, US, G, NY, Ry); Horse Creek, July 10, 1897, *Nelson 76* (NY); about clumps of willows on a creek bank, Mammoth Hot Springs, July 4, 1890, *Nelson & Nelson 5669 in part* (NY, G, AM, US, Ry, Cl); wet wooded copses, Soda Butte, July 14, 1899, *Nelson & Nelson 5835* (P); Mammoth Hot Springs, July 13, 1905, *Oleson* (Ry); Dome Lake, Elk Mountain, Sheridan Co., alt. 10,500 ft., June 28, 1897, *Pammel & Stanton* (M); dry stony slopes, mountains 5 miles east of Afton, Lincoln Co., alt. 10,000 ft., July 3, 1923, *Payson & Armstrong 3354* (Ry, M); Sheep Mountain (Ferry Peak), Snake River Range, near Alpine, Lincoln Co., moist banks, middle elevations, July 11, 1923, *Payson & Armstrong 3442* (Ry, Cl, M, ANS, G); cliffs, mountains near Cottonwood Lake, east of Smoot, Lincoln Co., alt. 10,000 ft., July 21, 1923, *Payson & Armstrong 3668* (G, M, ANS, Ry, Cl); limestone cliffs, Teton Pass Mountains, east of Victor, Idaho, alt. 9800 ft., July 25, 1920, *Payson & Payson 2140* (CAS, M, Ry, G, NY); Horse Creek, 7 miles west of Merna, Sublette Co., creek bank, July 16, 1922, *Payson & Payson 2726* (G, Ry, UCal, M, ANS); alpine rock slides, Wind River Mountains, 10 miles northeast of Fremont Lake, Sublette Co., July 30, 1922, *Payson & Payson 2886a* (Ry); moist ledges at summit, Saltlick Mountain, northeast of Kendall, Sublette Co., Aug. 7, 1922, *Payson & Payson 2971* (UCal, G, O, US, NY, Ry, M, ANS); small brook and hillsides on Deer Creek, north side of Laramie Mountains, Aug. 17, 1899, *Schuchert* (US); Little Medicine River, near the John Burnett Ranch, Aug. 18, 1899, *Schuchert* (US); Plumbago Cañon, Aug. 26–27, 1899, *Schuchert* (US); stream banks, Little Goose Canyon, Sheridan Co., June 22, 1913, *Sharp 365* (Ry); head of Big Goose Creek, Big Horn Mountains, July 15–24, 1893, *Tweedy 33* (US); headwaters of Tongue River, Big Horn Mountains, July, 1898, *Tweedy 118* (NY); Spread Creek, Teton Forest Reserve, alt. 6500 ft., Aug., 1897, *Tweedy 164* (NY); Big Horn, Sheridan Co., alt. 6000 ft., July, 1899, *Tweedy 2599, 2600* (NY); eastern slope of the Big Horn Mountains, headwaters of Clear Creek and Crazy Woman River, alt. 7000–9000 ft., July 20–Aug. 15, 1900, *Tweedy 3573, 3574* (NY, P, Ry); foothills, rolling plains between Sheridan and Buffalo, alt. 6000 ft., June 15–July 15, 1900, *Tweedy 3575* (NY); Copperton, Carbon Co., alt. 8700 ft., Aug. 5, 1901, *Tweedy 4265* (US, NY); Battle, Carbon Co., Continental Divide, alt. 10,000–11,000 ft., Aug. 1, 1901, *Tweedy 4266* (NY); river bottoms, Encampment, Carbon Co., alt. 7200 ft., June 15, 1901, *Tweedy 4267* (US, NY); bank of stream, 20 miles northwest of Lost Cabin, alt. 6000 ft., Fremont Co., July 5, 1921, *Wiegand, Castle, Dann & Douglas 2078* (Cl); banks of Trail Creek, vicinity of Teton Pass, Teton Co., alt. 7500 ft., July 1, 1932, *Williams 791* (NY, Ry, U, O, CAS, M); banks of Trail Creek, vicinity of Teton Pass, Teton Co., July 3, 1932, *Williams 797* (NY, M, O, Ry); hillsides and cliffs, Glacier Canyon, Grand Teton National Park, July 23, 1932, *Williams 926* (NY, M, O, Ry); spring bank, Roosevelt Meadows, headwater of the Hoback River, Lincoln Co., July 11, 1933, *Williams 1250* (W, M); moist hillside, Two Ocean Mountain, Continental Divide, Aug. 1, 1933, *Williams 1370* (M, W); in willows along Lizard Creek, Teton Co., June 20, 1934, *Williams 1622* (M, W); in willows along Pacific Creek, dense shade, Teton Co., June 29, 1934, *Williams 1640* (W, M); in tremendous masses along a creek below Lake Solitude, Aug. 9, 1934, *Williams 1700* (W, M); creek bank in moist woods, Happy Jack Canyon, Albany Co., June 6, 1934, *Williams 1712* (M, W); creek-bank near Powder River Pass, Big Horn Mountains, Johnson Co., July 4, 1935, *Williams 2335* (W, M, ND, P); rocky dry creek-bank near Libbey Creek, Medicine Bow Mountains, Albany Co., July 13, 1935, *Williams 2385* (W, M, ND, P); rocky roadside, Medicine Bow Mountains, Albany Co., along Libbey Creek, July 14, 1935, *Williams 2401* (W, M, ND); Bradley Lake, moist situation, June 24, 1931, *Williams & Pierson 209* (M, O, W); among willows, moist places, Black Rock Meadows, Teton Co., June 11, 1934, *Williams & Williams 1600* (M, W).

COLORADO: Chambers Lake, July 13, 1896, *Baker* (UCal, M, NY); Black Cañon, June 20, 1901, *Baker 189* (UCal, US, Ry, M, O, NY, G); Van Boxle's Ranch, above Cimarron, July 10, 1901, *Baker 403* (UCal, US, NY, G, Ry, O, M); Marshall Pass, alt. 10,000 ft., July 19, 1901, *Baker 486* (US, G, NY, P); near Pagosa Peak, alt. 12,000 ft., Aug., 1899, *Baker 559* (UCal, G, O, NY, US, Ry, AM, ND, TYPE *M. polyphylla*, M); near Pagosa Peak, alt. 10,000 ft., Aug., 1899, *Baker 560* (M, US, UCal, Ry, G, NY, O, AM, TYPE *M. punctata* not in ND, not seen); hills, Larimer Co., alt. 9500 ft., July 18, 1895, *Baker 7599* (US, Ry); along trail up cliff near Glass Lake, alt. 11,000 ft., Rocky Mountain National Park, Aug. 23–30, *Baker 4718b* (UCal); abundant along streams, Bob Creek, West LaPlata Mountains, June 26, 1898, *Baker, Earle, & Tracy 180* (Ry, M, N, G, US, NY, O, F, Cl); vicinity of Bald Pate, July 14, 1923, *Bebb 3204* (M); Breckenridge, *Bereman 769* (M); Green Mountain Falls, alt. 7500 ft., July 13, 1895, *Bessey* (NY); Cochetopa National Forest, July 20, 1911, *Bliss* (US); Middle Beaver Creek, alt. 11,000 ft., July 24, 1903, *Blumer* (G); Breckenridge, coll. of 1871, *Brandegee* (M); vicinity of Cañon City, near snow line, May, 1871, *Brandegee* (ANS); Fremont Co., 1873, *Brandegee 650* (ANS); Breckenridge, coll. of 1871, *Brandegee 277* (ANS); Ophir waterfall at the end of pipe-line, near Suffolk Mill, *Brewster* (C); Brookvale, Clear Creek Co., June 15, 1918, *Churchill* (M); Mt. Baldy, alt. 3500 m., July 15, 1901, *Clements & Clements 288* (US, NY, G, Cl, M, Ry); Peak Valley, alt. 3800 m., Aug. 21, 1901, *Clements & Clements 367* (US, NY, G, Ry, M, Cl); Dark Cañon, alt. 2800 m., Pike's Peak Region, July 15, 1901, *Clements & Clements 376* (G, US, NY, Ry, Cl, M); Turquoise Lake, Lake Co., damp shore, alt. 10,200 ft., July 3, 1915, *Clokey 2746* (Clokey); wet soil, Tolland, alt. 8800 ft., July 19, 1917, *Clokey 2851* (CAS, US, Clokey, Ry, Ariz, G, NY); moist soil, Lake Eldora, Boulder Co., alt. 9250 ft., July 18, 1918, *Clokey 3157* (Clokey); open ground, Everett, Lake Co., alt. 10,200 ft., July 6, 1919, *Clokey 3519* (Clokey, O); along wooded stream, Twin Lakes, 9400 ft., July 14, 1919, *Clokey 3553* (CAS, US, Clokey, NY, G); Estes Park, Aug. 10, 1904, alt. 8000 ft., *Cooper 284* (Ry); moist ground in shade, Hotchkiss, June 22, 1892, *Cowen* (NY); mountains above Boreas, alt. 12,000 ft., July 24, 1897, *Crandall* (UCal, NY, Ry); swamp, above Beaver Creek, alt. 9500–12,000 ft., July 7, 1896, *Crandall 1644* (US, G, UM, P); near Ironton, San Juan Co., July 21–31, 1899, *Curtis* (Ry, NY); near snow, Broomerville, alt. 10,000 ft., July 7, 1906, *Daniels 320* (M); Trapper's Lake, alt. 10,000 ft., Aug. 31, 1910, *Dirce 7481* (C); Gray's Peak, July, 1888, *Eastwood* (C); Columbia Mine, Telluride, May 18, 1896, *Eby* (M); vicinity of Mt. Carbon, Gunnison Co., alt. 2730 m., July 6, 1910, *Eggleston 5881* (US); western slope of Mt. Massive, Leadville Forest, Lake Co., alt. 3100–4000 m., Sept. 10, 1915, *Eggleston 11883* (US); along Spring Creek, above Idaho, July 31, 1874, *Engelmann* (M); banks of mountain streams, below Berthoud Pass, alt. 10,000–11,000 ft., Aug. 10, 1874, *Engelmann* (M); wet rocks, Georgetown, Aug. 17, 1874, *Engelmann* (M); Palmer Lake, July 13, 1901, *Ferril* (C); Hancock, Aug. 17, 1905, *Ferril* (C); divide between Arkansas River and South Park, coll. of 1845, *Fremont's Expedition to Rocky Mts.* (US, NY); Crystal Park, near Manitou, Aug. 14, 1885, *Fritchey* (M); Berthoud Pass, Aug. 5, 1930, *Fuller* (M); marshes, summit of North Park Range, Larimer Co., Aug. 11, 1903, *Goodding 1855* (US, Ry, Cl, UCal, M, G, NY, C, ANS); near Golden City, coll. of 1870, *Greene* (G); Ruxton Creek, Pike's Peak, July 22, 1919, *Hall* (UCal); moist soil on edge of stream near Lake Common, Trappers Lake, Garfield Co., Aug. 3, 1933, *Hanna 1344* (M); along creek near Ward, alt. 9400 ft., June 25, 1931, *Hanson C294* (M); Cameron Pass, Sept. 2, 1890, *Herb. State Agric. Coll. 1639* (NY); rocky bank of White River, one-fourth mile north of Trappers Lake, alt. 9450 ft., July 29, 1933, *Hermann 5441* (G); Red Mountain, Aug. 6, 1904, *Huestis 2117* (C); crevices of rocks along the streams within the Rocky Mountains, *James* (NY TYPE); on Long's Peak, July, 1905, *Johnston 80* (Ry); along stream, Allens Park, July 17, 1917, *Johnston & Hedgcock 542* (G); Manitou, July, 1878, *Jones* (US); Gray's Peak, alt. 11,500 ft., Aug. 28, 1878, *Jones 693* (NY, G, U); above Vallecito, alt. 12,000 ft., Sept. 4, 1903, *Knowlton 56* (US); near Breckenridge, Summit Co., alt. 12,000 ft., Aug., 1901, *Mackenzie 321* (M, Ry); near a stream, Wagon Wheel Gap Exp. Station, Mineral Co., June 25, 1911, *Murdoch 4639* (CAS, US, Clokey, M); Cameron Pass, Larimer Co., Aug. 5, 1893, *Osterhout* (O); Estes Park, Larimer Co., July 17, 1897, *Osterhout* (UCal); moraine, Estes Park, Larimer Co., June 23, 1894, *Osterhout 308* (O); Dale Creek, Larimer Co., July 19, 1899, *Osterhout 1869* (O); Red Cliff, Eagle Co., June 26, 1900, *Osterhout 2165* (O); Ward, Boulder Co., July 17, 1901, *Osterhout 2449* (O, NY); Moraine Park, Larimer Co., July 20, 1903, *Osterhout 2823* (O, NY TYPE *M. picta*); above Arrow, Grand Co., July 20, 1906, *Osterhout 3284* (O); Chambers Lake, Larimer Co., July 3, and Aug. 12, 1908, *Osterhout 3728, 3780* (O); Buckhorn Creek, Larimer Co., June 3, 1916, *Osterhout 5499* (O); Long's Peak Inn, Larimer Co., July 13, 1917, *Osterhout 5651* (O); wet rocky ground, near Tolland, Gilpin Co., June 24, 1926, *Palmer 31264* (M); Baldwin Cañon, Alpine Co., July 2, 1876, *Papineau 65* (US); Colorado Territory, coll. of 1872, *Parry* (G, NY, ANS, M); from the head-waters of Clear Creek, and the alpine ridges lying east of "Middle Park," Colorado Territory, coll. of 1861, *Parry 285* (NY, M, G); Colorado Territory, lat. 39–41°, coll. of 1862, *Parry 442* (US); brookside, Uncompahgre Divide, alt. 9000 ft., July 27, 1914, *Payson 538* (M, C, G, Ry); subalpine basin, Pike's Peak, Aug. 2, 1919, *Payson 1568* (Ry, M); Silver Lake, Aug., 1914, *Phelps* (CAS); Gray's Peak, Aug. 10, 1871, *Porter* (US); North Boulder Creek, alt. 2700 m., June 30, 1905, *Ramaley 1176* (C); Ward, July 18, 1907, *Ramaley 3179, 3220* (UCal); South Boulder Canyon, Boulder Park, Tolland, alt. 6800 ft., Aug. 24, 1907, *Ramaley 3817* (UCal, Ry, AM, C); stream-side, Mammoth Gulch, July 4, 1908, *Ramaley 5349* (C); in shade of willows, Corona Lake, Aug. 28, 1908, *Ramaley 6085* (C); Jenny Lake, July 8, 1909, *Ramaley 6613* (C); Stuart Lake, near Tolland, July 31, 1918, *Ramaley 11438* (C); near 4th July Mine, July 29, 1906, *Ramaley & Robbins 2466* (Ry) and *2566* (C); North Boxelder, alt. 7000 ft., June 8–11, 1907, *Ramaley & Robbins 2806* (C); Rollins Pass, Corona, alt. 11,000–11,700 ft., Aug. 7–8, 1907, *Ramaley & Robbins 3327* (Ry, C); near Hot Sulphur Springs, alt. about 7600 ft., Aug. 3–8, 1907, *Ramaley & Robbins 3651* (C, Ry); shrub zone around lake, Tolland, July 4, 1908, *Ramaley & Robbins 5177, 5687* (C); Tolland, July 4, 1908, *Ramaley & Robbins 5222* (Ry); Redrock Lake about 4 miles west of Ward, Boulder Co., alt. about 10,000 ft., Aug. 18, 1908, *Ramaley & Robbins 6031* (C); flank of Snowy Range, Wet Mountain Valley, July 24, 1872, *Redfield* (M); Sugar Loaf Mountain, July 21, 1906, *Robbins 2177, 2208* (Ry, C); Eldora, July 27, 1906, *Robbins 2308* (C, Ry); near Beulah, June 5–9, 1908, *Robbins 4969* (C, Ry); Mt. Audubon, July 19, 1908, *Robbins 5842* (C); Duck Lake, July 20, 1908, *Robbins 5924* (C); East Lake, Tolland, June 22, 1910, *Robbins 7700* (C); Forest Lakes, June 26, 1910, *Robbins 7740* (C); Georgetown, Aug. 19, 1895, *Rydberg* (NY); West Indian Creek, June 14–15, 1900, *Rydberg & Vreeland 5692* (NY, Ry); headwaters of Pass Creek, June 30, 1900, *Rydberg & Vreeland 5693* (NY); Halfway House, Pike's Peak, May 3, 1896, *Shear 3716* (NY, US); Georgetown, Aug. 20, 1895, *Shear 4711, 4712* (NY); Ouray, July 26, 1897, *Shear 4923* (NY); swamp-borders, North Park near Teller, alt. 8000 ft., July 30, 1884, *Sheldon 144* (US); shady moist places, Buena Vista, alt. 8000 ft., July 5, 1892, *Sheldon 533* (US); Gray's Peak, at timberline, Aug. 31, 1884, *Smith* (ANS); Rollins Pass, alt. 11,660 ft., Aug. 17, 1905, *Smith* (ANS, M); South Park, Aug., 1874, *Smith 15* (NY); Farnham, July 10, 1891, *Smith* (M, P); 15 miles from Pagosa Springs, on Wolf Creek Pass Road, alt. 7000–7500 ft., May 28, 1934, *Stone 568* (NY); common at head of West Miller Creek, White River Region, Aug. 7, 1908, *Tidestrom 1676* (US); vicinity of Mt. Carbon, abundant in moist draws and along streamlets, July 11, 1910, *Tidestrom 3740* (US); Argentine Pass, July 15, 1886, *Trelease* (M); La Plata Mountains, alt. 11,500 ft., July 20, 1896, *Tweedy 551* (US); Eldora to Baltimore, alt. 8500–9500 ft., June 20–July 10, 1903, *Tweedy 5666* (NY, Ry); Uncompahgre Forest, alt. 11,500 ft., July 10, 1913, *Watkins 132* (US); moist meadows, Rabbit Ears Pass, Jackson Co., July 20, 1935, *Williams 2426* (M, ND, P, W); summit Wolf Creek Pass, San Juan Mountains, Mineral Co., July 28, 1928, *Wolf 2998* (CAS, G); June, 1873, *Wolf 709* (US); slopes of Mt. Chapin, Larimer Co., Aug. 14, 1927, *Woodson 1862* (M); Pike's Peak, June 27, 1907, *Wooton* (AM); Estabrook, Park Co., July 15, 1919, *Young* (Cl); Duck Lake, July 18, 1935, *Zobel* (CAS).

NEW MEXICO: low wet banks along Costilla Creek, Costilla Park, Taos Co., alt. 9600 ft., Sept., 1894, *St. John 6* (G).

ARIZONA: without definite locality, coll. of 1869, *Palmer* (US); without definite locality, coll. of 1876, *Palmer 378* (US, ANS, F).

IDAHO: "Thornburg's Ravine" of Nuttall, Wildhorse Creek, head of Big Lost River, Lemhi Forest, Custer Co., alt. 2400 m., Aug. 4, 1917, *Eggleston 14075* (US, G); along creek from Meadow Lake, Lemhi Range, alt. 9000 ft., Aug. 23, 1921, *Hall 11531* (G); Soldier Mountains, alt. 8000 ft., July 16, 1895, *Henderson 3193* (US); loamy stream-sides, shade, Silver City, Owyhee Co., July 18, 1910, *Macbride 416* (US, G, NY, UCal, Ry, P, M); stream bank, Trinity Lake region, Elmore Co., alt. 8000 ft., Aug. 30, 1910, *Macbride 693* (Ry); edge of meadow near creek, Corral, Blaine Co., alt. 5700 ft., June 28, 1916, *Macbride & Payson 2926* (G, NY, US, UCal, CAS, Ry, M); wet creek bank, Bear Creek below Parker Mountain, Custer Co., alt. 6000 ft., July 18, 1916, *Macbride & Payson 3282 in part* (UCal, NY); creek bank, Bonanza, Custer Co., alt. 6500 ft., July 28, 1916, *Macbride & Payson 3491* (M, Ry, G); moist gorge near stream, Smoky Mountains, Blaine Co., alt. 9000 ft., Aug. 13, 1916, *Macbride & Payson 3742* (US, G, Ry, M); moist brook bank, Smoky Mountains, Blaine Co., alt. 9500 ft., Aug. 13, 1916, *Macbride & Payson 3759* (US, CAS, NY, UCal, G TYPE *M. incongruens,* M, Ry); Owyhee Mountains, July, 1892, *Mulford* (M); stream edge, Deer Creek, Owyhee Co., July 1, 1912, *Nelson & Macbride 1854* (Ry); swampy ground, Caribou Mountain, Bonneville Co., July 19, 1923, *Payson & Armstrong 3582* (G, Ry, M); protected calcareous cliffs, base to summit of mountains northeast of lake, Henry Lake, Fremont Co., alt. 9200 ft., July 11, 1920, *Payson & Payson 1956* (M, NY, Ry, G) and *1957* (NY, CAS, G, M, Ry); shady banks, Henry Lake, Fremont Co., alt. 6000 ft., July 12, 1920, *Payson & Payson 1999* (NY, G, M, Clokey, CAS, Ry); cliffs on north side of peak, base to summit of mountains northeast of lake, Henry Lake, Fremont Co., alt. 9200 ft., July 17, 1920, *Payson & Payson 2050* (G, CAS, NY, Ry, M); Palisade National Forest, St. Anthony, June 28, 1915, *Pickett 100* (Ry); moist situations in good soil, Sawtooth National Forest, Hailey, coll. of 1910, *Woods 325* (Ry); Poison Creek, Sawtooth Mountains, July 31, 1909, *Woods & Tidestrom 2627* (US).

UTAH: Silver Lake, Big Cottonwood Cañon, Sept. 30, 1909, *Clemens* (NY, Clokey); Silver Lake, Big Cottonwood Cañon, Sept. 14, 1910, *Clemens* (Clokey); June–July, 1869, *Eaton 247* (CAS); Uinta Mountains, Aug. 23, 1859, *Engelmann* (M); Big Cottonwood Canyon, Salt Lake Co., July 22, 1905, *Garrett 1510, 1513* (NY); in wet places in rich soil, Big Cottonwood Canyon, Salt Lake Co., Aug. 1, 1906, *Garrett 1888* (NY); Mt. Timpanogos, Wasatch Mountains, Utah Co., July 25, 1927, *Garrett 3696a* (CAS); Mt. Timpanogos, Wasatch Mountains, Utah Co., Aug. 6–15, 1930, *Garrett 5674, 5725* (G) and *5760* (UCal); Bald Mountain, Uintah Co., Aug. 7, 1930, *Garrett 5685* (F); along creeks, Dyer Mine, Uinta Mountains, June 30, 1902, *Goodding 1200* (US, G, NY, Cl, Ry, M); damp grassland near willows, Uinta Mountains, Summit Co., alt. 2600 m., June 23, 1931, *Goodman 1837* (US, M, NY, G); damp soil in willows, near Bear River, Summit Co., alt. 2460 m., June 28, 1931, *Goodman 1842* (US, UM, M, NY, G); alpine in the Uinta Mountains, Summit Co., alt. 3600 m., Aug. 4, 1931, *Goodman 1899* (US, G, NY, M); along stream, East Fork of Bear River, Uinta Mountains, Summit Co., alt. 8900 ft., July 9–13, 1930, *Goodman & Hitchcock 1492* (CAS, M, UCal, NY, O, G); near snow banks, divide between East Fork of Bear River and Black's Fork, Uinta Mountains, Summit Co., alt. 11,000 ft., July 9–13, 1930, *Goodman & Hitchcock 1513* (UCal, CAS, NY, O, G, M); along creek north of Moon Lake, Duchesne Co., alt. 8200 ft., July 1, 1931, *Graham 6552* (W, Carnegie, M); Blanchard Park, head of Dry Fork Creek, Uintah Co., alt. 10,000 ft., July 5, 1933, *Graham 8393* (W, Carnegie, M); meadow above trees, north of Chain Lakes, southeast slope of Mt. Emmons, Duchesne Co., alt. 11,400 ft., July 20, 1933, *Graham 8569* (W, Carnegie, M); along stream, in lodgepole spruce woods between Paradise Park and Chepeta Lake, Uinta Mountains, Uintah Co., alt. 10,000 ft., Aug. 20, 1935, *Graham 10086* (W, Carnegie, M); damp sandy creek bank, Moon Lake, Ashly Forest, Duchesne Co., alt. 8100 ft., June 16, 1934, *Harrison & Larsen 7741, 7742* (M); grassy savannah, bordered by willows, Carter Creek, Daggett Co., alt. 8200 ft., June 19, 1934, *Harrison & Larsen 7885* (M); rocky alpine meadow, ground moraine at timber line, Krebs Basin, southeast slope, Mt. Emmons, Duchesne Co., alt. 11,300 ft., July 18, 1933, *Hermann 4934, 4934½* (G); edge of timber line, northwest slope, Lamotte Peak, Summit Co., alt. 11,200 ft., Aug. 15, 1933, *Hermann 5959* (G); crevices in loose rock, barren northwestern slope, Lamotte Peak, Summit Co., alt. 11,800 ft., Aug. 15, 1933, *Hermann 5967* (G); American Fork, July 6, 1895, *Jones* (UCal, NY); Alta, Wahsatch Mountains, Bald Mountain, alt. 11,000 ft., Aug. 13, 1879, *Jones 1256* (NY, U); along stream in aspen, Tony Grove, Logan Canyon, Cache Co., Sept. 22, 1932, *Maguire & Maguire 3726* (U); about spring in meadow, spruce belt, saddle between Mt. Peale and Mt. Tukunikivatz, San Juan Co., alt. 10,500 ft., July 5, 1932, *Maguire & Redd 2116* (U); wet place under cliffs, Stillwater Basin, head Bear River, Summit Co., alt. 11,500 ft., Aug. 18, 1933, *Maguire, Richards & Maguire 4241* (U, G); in Krumholtz, southeastern slopes of saddle west of Mt. Agassiz, Duchesne Co., alt. 11,200 ft., Aug. 16, 1933, *Maguire, Richards & Maguire 4244* (M, G, U); along stream, north base of Haystack Mountain, Grand Co., alt. 9200 ft., July 9, 1933, *Maguire, Richards, Maguire & Hammond 5115* (UCal, G, U); in spruce, grassy north slopes of Greene Mountain, Grand Co., alt. 10,750 ft., July 13, 1933, *Maguire, Richards, Maguire & Hammond 5116* (G); in moist ravines, marsh, Peterson Canyon, Peterson, alt. 8000–10,000 ft., July 19, 1902, *Pammel & Blackwood 3820* (G, M); Stillwater Cañon, Bear River, alt. 9000–10,500 ft., Aug. 1, 1902, *Pammel & Blackwood 4234* (G, M); along streams, La Sal Mountains, Grand Co., alt. 10,500 ft., July 22, 1924, *Payson & Payson 3950* (M, UCal, Ry, G); along streams, west fork of Bear River, Uinta Mountains, Summit Co., alt. 9700 ft., July 8, 1926, *Payson & Payson 4929* (US, G, M, Ry); Mirror Lake, Duchesne Co., Aug. 2, 1932, *Richards 4242* (G, U); Mt. Lofty, divide between Weber and Bear River, Summit Co., alt. 11,300 ft., Aug. 3, 1932, *Richards 4243* (U); Big Cottonwood Cañon, below Silver Lake, June 29, 1905, *Rydberg & Carlton 6436* (NY), *6438* (NY, Ry) and *6470* (US, NY); La Sal Mountains, alt. 3000–3300 m., July 7, 1911, *Rydberg & Garrett 8721* (NY); Gold Basin, La Sal Mountains, alt. 3000–3300 m., July 11, 1911, *Rydberg & Garrett 8848* (NY); Horse Gulch and vicinity, La Sal Mountains, alt. 3000–3300 m., July 15, 1911, *Rydberg & Garrett 8960* (US, Ry, NY); La Sal Mountains, near Mt. Peal, alt. 3300–3700 m., July 17, 1911, *Rydberg & Garrett 8999* (NY, Ry, US); Provo Canyon, Wasatch Mountains, alt. 7000 ft., June 11, 1930, *Van Dyke* (CAS); Uintas, alt. 7000 ft., July, 1869, *Watson 842* (NY).

NEVADA: Clover Valley, Humboldt Mountains, July 14, 1902, *Deehl* (US); Star Canyon of Deeth, Elko Co., alt. 5600 ft., July 10, 1912, *Heller* (US, NY); Clover Mountain Range, near Deeth, East Humboldt or Ruby Mountains, Elko Co., alt. 9000 ft., July 24, 1908, *Heller 9236* (US, G, NY); Lamoille Canyon east of Lamoille, East Humboldt or Ruby Mountains, Elko Co., alt. 7050 ft., Aug. 6, 1908, *Heller 9327* (NY); ridge on the north side of Lamoille Canyon, East Humboldt or Ruby Mountains, Elko Co., alt. 8950 ft., Aug. 8, 1908, *Heller 9373* (NY); moist ground, vicinity of Gold Creek, Pine Mountain, Aug. 7, 1913, *Hitchcock 1107* (US); moist ravine, Duck Creek Cañon 4 miles southeast of Paine's Ranch, Aug. 17, 1913, *Hitchcock 1388* (US); Martin Creek, Humboldt Reserve, Elko Co., *Kennedy 4266* (ANS); stream flat, Jarbidge, alt. 7000 ft., July 8, 1912, *Nelson & Macbride 1994* (US, G, NY, Clokey, Ry); East Humboldt Mountains, alt. 7000 ft., Aug. 1868, *Watson 842* (US, NY, G).

OREGON: moist ground, Fish Lake, Stein's Mountains, Harney Co., July 20, 1927, *Henderson 8312* (CAS); bank of Wild Horse Creek, east slope of Stein Mountains, June 28, 1925, *Peck 14128* (Willm); moist ground 16–17 miles east of Prairie City, Grant Co., July 18, 1928, *Peck 16040* (Willm, M); Athena, coll. of 1917, *Stewart* (Willm).

12a. Mertensia ciliata var. **subpubescens** (Rydb.) Macbr. & Payson in Contr. Gray Herb. N. S. No. 49: 67. 1917.

M. subpubescens Rydb. in Bull. Torr. Bot. Club **30**: 261. 1903.

M. ciliata var. *subpubescens* forma *candida* Macbr. & Payson, *l.c.*

Leaves with spreading or appressed pubescence on the lower surface; pedicels usually strigose; otherwise as the species.

Distribution: western Montana, north-central and northwestern Wyoming, and adjacent Idaho.

MONTANA: common, mountain cañons, Bozeman, June 18, 1900, *Blankinship* (M, G, Ry); Helena, June 25, 1908, *Butler 750, 751* (NY); Tobacco Mountans, July 13, 1909, *Butler* (UCal, NY); Tobacco Mountains, July 15, 1909, *Butler 4230* (NY); Flathead Ranger Station, Gallatin Forest, alt. 6500 ft., July 20, 1921, *Cringer 237* (UM); in moist, stony stream-ways, near timber line, Mt. Tiny, alt. 9000 ft., Aug. 29, 1921, *Hall 11599* (G); drying hillside, just above stream, Daly Creek, on Skalkaho Road, Ravalli Co., alt. 7000 ft., Aug. 9, 1933, *Hitchcock 2061* (CAS, G, UM); along streams in shady places high in the mountains, Aug. 18, *Howard 304* (G); Alta, alt. 5000 ft., July 23, 1909, *Jones* (G, UM); near Helena, 1889, *Kelsey* (NY); above Cooke City, alt. 9750 ft., Aug. 29, 1887, *Knowlton* (US); Hulse's Cabin, Crevasse Mountain, Park Co., alt. 8000 ft., July 20, 1902, *Mearns 2046* (NY); along banks of small mountain stream, near Elk Park, Jefferson Co., July 10, 1930, *Palmer 36987* (US, G, M); black loam, Crock Lake Pasture, Madison Forest, alt. 8000 ft., July 10, 1922, *Riggle 12* (UM); mountains near Indian Creek, alt. 8000 ft., July 21, 1897, *Rydberg & Bessey 4872* (US, NY); Bridger Mountains, alt. 7000 ft., June 18, 1897, *Rydberg & Bessey 4875* (NY); Spanish Basin, Gallatin Co., alt. 6500 ft., June 23, 1897, *Rydberg & Bessey 4876 in part* (NY TYPE, US, Ry, F, UM); Deer Lodge Co., 1901, *Scheuber 42* (NY); rich open woods, West Gallatin River, June 9, 1883, *Scribner 175* (US, ANS, G); Helena, Aug., 1892, *Starz* (M); Mystic Lake, July 25, 1895, *Shear 3076* (US, NY); bank of stream, Leverich Canyon, Gallatin Co., June 25, 1929, *Swingle* (Ry); near East Entrance, Glacier National Park, June 30, 1930, *Van Dyke* (CAS).

WYOMING: Lower Falls of the Yellowstone, July 26, 1871, *Adams* (US); Sylvan Pass, Yellowstone National Park, July 19, 1924, *Ballou* (Ry); wet shaded places near Mammoth Hot Springs, alt. 6200 ft., July, 1893, *Burglehaus* (US); wet hillside, Ten Sleep Lakes, Big Horn Co., July 30, 1901, *Goodding 409 in part* (NY, US, Ry, G); Tower Falls, Aug. 7–12, 1922, *Hawkins 633* (US); Yellowstone Park, summer of 1904, *McDonald* (CAS); from stream under the bridge at Lookout Point, Lower Falls of the Yellowstone, July 30, 1889, *Mearns* (US); Yellowstone National Park, June 15, 1902, *Mearns 1126* (US); about clumps of willows on a creek bank, Mammoth Hot Springs, July 4, 1899, *Nelson & Nelson 5669 in part* (M); in open, dry, stony draws, Dunraven Peak, Aug. 27, 1899, *Nelson & Nelson 6704 in part* (Ry); Norris, Yellowstone Park, *Oleson in part* (Ry); Mammoth Hot Springs, Yellowstone Park, July, 1905, *Oleson in part* (Ry); west branch Big Goose, Sheridan Co., June 30, 1897, *Pammel & Stanton* (M); moist loam, Little Rocky, Clark's

Fork Valley, alt. 5500 ft., June 22, 1924, *Pearson & Pearson 36* (Ry); Electric Peak, alt. 9000–11,000 ft., Aug. 18, 1897, *Rydberg & Bessey 4864* (US, NY); Yellowstone Park, 1865, *Tweedy* (US); Mirror Lake plateau, alt. 8900 ft., Aug. 1885, *Tweedy 811* (US); Grand Teton National Park, June 22, 1930, *Van Dyke* (CAS); Yellowstone Park Canyon, June 30, 1919, *Young* (Cl).

IDAHO: Morgan Creek, Challis Forest, Custer Co., July 29–30, 1917, *Eggleston 13960* (US); heavy black soil, moist location on bottom of canyon, Lemhi Forest, July 31, 1911, *Huddle 27* (Ry); damp sunny places in woods, along creeks, Salmon, Aug. 2, 1896, *Kirtley* (Cl); along creek, Clyde, Blaine Co., alt. 5600 ft., July 10, 1916, *Macbride & Payson 3119* (US, UCal, Ry, NY, M, CAS, G); along creek in open forest, Parker Mountain, Custer Co., alt. 7000 ft., July 17, 1916, *Macbride & Payson 3272* (G TYPE *M. ciliata* var. *subpubescens* f. *candida*); near brook, Parker Mountain, Custer Co., alt. 7000 ft., July 17, 1916, *Macbride & Payson 3279* (US, G, CAS, M, UCal, NY, Ry); wet creek bank, Bear Creek below Parker Mountain, Custer Co., July 18, 1916, *Macbride & Payson 3282 in part* (UCal, US, CAS, G, Ry, M); creek bank, Bonanza, Custer Co., alt. 6500 ft., July 28, 1916, *Macbride & Payson 3492* (NY, US, CAS, G, M, UCal, Ry); lake margins, Craters of the Moon, July, 1926, *Rhodenbaugh 18* (Ry).

12b. M. ciliata var. **latiloba**, var. nov.[1]

Similar to the species; calyx 3.5–4.5 mm. long, divided almost to the base, the lobes 1.25–1.5 mm. broad at the base, lanceolate to triangular-lanceolate, acute or obtuse, ciliate, glabrous on the back, short-strigose within.

Distribution: known only from the type locality.

IDAHO: Bear River Range, Franklin Basin above Gibson Lake, Oneida Co., July 25, 1910, alt. 9100 ft., *Smith 2291* (NY TYPE, U).

12c. M. ciliata var. **stomatechoides** (Kellogg) Jepson, Man. Fl. Pl. Cal. 842. 1925.

M. stomatechoides Kellogg in Proc. Cal. Acad. Sci. **2**: 148. 1863.

M. californica Eastw. ex C. F. Baker, West. Am. Pl. **3**: 8. 1904, name only.

Calyx-lobes 2.5–6 mm. long, usually obtuse but occasionally acute or acutish; style usually much exceeding the corolla.

Distribution: in the Sierras, California and adjacent Nevada.

NEVADA: Snow Valley, Ormsby Co., alt. 2460–2615 m., June 24, 1902, *Baker 1154* (P, M, NY, G, US, UCal); about Marlette Lake, Washoe Co., alt. 2460 m.,

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[1] **M. ciliata** var. **latiloba** var. nov., *M. ciliatae* simulans; calyce 3.5–4.5 mm. longo, fere ad basem diviso, lobis basi 1.25–1.5 mm. latis, lanceolatis vel triangulari-lanceolatis, acutis vel obtusis, glabris, ciliatis.

July 10, 1902, *Baker 1302* (CAS, Ry, M, NY, US, G, UCal); Chiatovitsh Creek, White Mountains, Esmeralda Co., alt. 2450 m., June 7, 1931, *Duran 3071* (M, CAS, Cl, U, Ry, NY, UCal); West Humboldt Mountains, alt. 8000 ft., June, 1868, *Watson 842* (G, NY, US).

CALIFORNIA: Light's Cañon, Plumas Co., coll. of 1872, *Ames* (ANS, NY); Plumas Co., *Austin* (P); Indian Valley, Plumas Co., coll. of 1877, *Austin* (UCal); Colby, Butte Co., July, 1896, *Austin 91* (M, US); Lassen Creek, July, 1894, *Austin 276* (UCal); summit grade, between Prattville and Brices, coll. of 1883, *Austin 442* (UCal); Colby, Butte Co., June 20, 1897, *Austin 1193* (US); springy places, Modoc Co., June, 1898, *Austin & Bruce 2372* (UCal, NY); moist ground about Mineral King, July 1, 1930, *Baker 4213* (Ry); Jones, Butte Co., June 16, 1923, *Bassett* (CAS); granite soil, Aspen Valley, Sierra Nevada Mountain Range, alt. 6400 ft., July 3, 1932, *Benson 3855* (US, NY); without locality, *Bolander* (US); "Southern Sierras," *Bolander 2487* (G); Mt. Gilliman, *Brandegee* (UCal); Woolverton Creek, Tulare Co., Aug., 1905, *Brandegee* (UCal); Giant Forest, Tulare Co., Aug. 12, 1905, *Brandegee* (UCal); Kit Carson Pass, Alpine Co., summer of 1930, *Branson* (CAS); Sierras east of Visalia, Tulare Co., June 17–18, 1864, *Brewer 2787* (US); Coyote Peak, July 8, 1916, *Campbell* (CAS); Yosemite Creek, Yosemite National Park, Aug. 8, 1919, *Clemens* (CAS); Crystal Lake, Plumas Co., June 23, 1920, *Clemens* (CAS); beside Butte Creek, Jonesville, Butte Co., July 11, 1920, *Copeland 379* (UCal); occasional in low woods, Jonesville, Butte Co., alt. 1500 m., June 23, 1930, *Copeland 450* (Ariz, CAS, UCal, G, US, NY, M, Ry, U, Cl); in clumps and masses, Kirby Meadows, Jonesville, Butte Co., June 11, 1931, *Copeland 1529* (UCal); Mineral King, Sierra Nevada, alt. 2750 m., July 31, 1891, *Coville & Funston 1398* (US); Hockett's Meadow, Tulare Co., July 16, 1904, *Culbertson 4375* (UCal, M, CAS TYPE *M. californica*, NY, G); mountain meadow, Sequoia National Park, Tulare Co., alt. 6700 ft., July 3, 1928, *Derby* (CAS); Kaweah Creek, Sequoia National Park, Tulare Co., alt. 6700 ft., July 4, 1928, *Derby* (CAS); Ebbett Pass, Alpine Co., June 3, 1934, *Derby* (CAS); near Harden Lake, Aug. 9, 1907, *Eastwood 189* (US, CAS, G); trail to Angora Lake, Glen Alpine Region, July 21–Sept. 5, 1906, *Eastwood 1318* (CAS); Wheats Meadow Ranger Station, Stanislaus Forest, Tuolumne Co., alt. 2000 m., June 11–17, 1913, *Eggleston 9321* (US); near White Wolf, alt. 8000 ft., July, 1901, *Evans* (UCal); meadow opposite Phillips, alt. 7000 ft., July 23, 1918, *Evans* (UCal); Mineral King, Tulare Co., July, 1923, *Fox* (CAS); head of Carson River, *Gibbs* (CAS TYPE); Crescent Meadow, Sierra Nevada Mountains, alt. 7000 ft., July, 1902, *Grant 776* (US, Ariz); swamp, Crescent Meadow, July 7, 1902, *Grant 1239* (US); rather dry, exposed places, Jonesville, Butte Co., alt. 5100 ft., July 25, 1914, *Hall 9784* (UCal, US, NY); Collins Meadow, Sierra Nevada Mountains, Fresno Co., alt. 7500 ft., July, 1900, *Hall & Chandler 456* (UCal, M, ANS, NY, US); Sequoia Region, Alpine Co., alt. 8500 ft., July, 1892, *Hansen 424* (M); Yosemite National Park, July 21–22, 1915, *Hitchcock* (US); Alta Meadows, Kaweah River Basin, Aug. 24, 1901, *Hopping 65* (UCal); moist meadow, Buck Camp Trail, Yosemite Park, Mariposa Co., Aug. 1, 1923, *Howell 209* (CAS); Sierra Valley, June, 1932, *Jackson* (CAS, UM); meadow near Camp Baxter, North Fork of the Stanislaus River, alt. 6000–7000 ft., July 8, 1930, *Jussel* (UM, CAS); Sierra Valley, May 20, 1889, *Lemmon* (UCal); Sierra Co., coll. of 1874, *Lemmon 164* (ANS) and *473* (G); Big Creek region, Fresno Co., July, 1915, *McDonald* (G, US, CAS); meadows, Eagle Peak, Yosemite, July 4, 1922, *Michaels* (CAS); Yosemite Valley, *Moore*

546 (CAS); Silver Lake, Amador Co., alt. 7200 ft., July 27–Aug. 5, 1904, *Mulliken 143* (UCal); common in shaded wet meadows, trail from Tioga Road to Yosemite Falls, alt. 7800 ft., July 25, 1923, *Munz 7502* (NY, Ry); Potter Valley, Mendocino Co., April, 1898, *Purpus* (UCal); brooks, in Farwell Gap, alt. 10,200 ft., Sept., 1897, *Purpus 5233* (US, UCal); Soda Spring, Kern River, alt. 8500 ft., Oct., 1875, *Rothrock 421* (G); Pyramid Peak, Sierra Nevada Mountains, alt. 9500 ft., July 16, 1913, *Smiley 121* (G); cañon near Sardine Valley, Nevada Co., June, 1887, *Sonne* (UCal); Sardine Valley, Nevada Co., July, 1891, *Sonne* (NY); along streams, Sardine Valley, Nevada Co., July, 1891 *Sonne* (NY); Sardine Valley, Sierra Co., July, 1891, *Sonne* (M); Sardine Valley, Nevada Co., June, 1887, *Sonne 442* (ANS, M); Salt Spring Reservoir, Calaveras Co., June, 1923, *Steinbeck* (CAS); Camp Sacramento, Eldorado Co., July, 1925, *Vortreide* (CAS).

Mertensia ciliata is the commonest and most widely distributed of the tall, aestival species within the Rocky Mountains. Although easily recognized it is found to vary considerably in diverse parts of its range. The tube of the corolla is usually longer than the limb but the reverse condition is not uncommon, particularly in the southern part of its range. The corolla is also quite variable in size, and extreme sizes on different clumps within the same colony are not unusual. The altitudinal range of the species is rather great, as are the habitats in which it occurs. It has been followed from 6,000 to 10,500 feet altitude in northwestern Wyoming. There is a constant reduction in size from similar habitats as one follows it upward. A reduced form found in a high altitude is the basis of the name *M. incongruens*. Situations in relation to moisture are equally diverse. The species has been observed growing in a spring in dense shade and on open hillsides which soon become dry. Leaves are extremely variable in shape and size, as also is their abundance on the stem; these characters have been used specifically. The normal glabrous condition of the leaves in the species is occasionally varied by having the upper surface papillose, especially toward the apex; these papillae may be rarely mucronate on the uppermost leaves.

Mertensia ciliata var. *subpubescens* is an unimportant variation, having the lower surface of the leaves pubescent, which takes the place of the species to a large extent in the northern part of the range. The species and the variety occur together.

Mertensia ciliata var. *latiloba* is a little-known variation which differs from the species mainly in the structure of the calyx.

Mertensia ciliata var. *stomatechoides* completely takes the place of the species in the Sierras of California and in adjacent Nevada. The structure of the calyx is the principal character by which it may be separated from the species, a character which is extremely variable. In its extreme form the character of the calyx, along with minor characters which are to be found in the corolla and the fairly disjunct range, might well argue for its distinctness as a species. However, the entity contains forms which can scarcely be distinguished from *M. ciliata* on a criterion other than range. The two extremes within the variety are connected by all stages of intergrading forms.

13. **Mertensia umbratilis** Greenm. in Erythea **7**: 118. 1899.
M. infirma Piper in Contr. U. S. Nat. Herb. [Fl. Wash.] **11**: 476. 1906.
M. ambigua Piper, *l.c.* 477.

Stems erect or ascending, 1.5–6 dm. tall, one to many from each rootstalk; blade of the basal leaves ovate to ovate-oblong, 6–11 cm. long, 3–6 cm. broad, obtuse, glabrous or rarely sparsely strigose on the upper surface, base decurrent on the petiole, petiole 5–8 cm. long; cauline leaves oblong-ovate to oblong-lanceolate, 4–10 cm. long, 1–5 cm. broad, obtuse or acute at the apex, sessile or the lowermost short-petiolate, upper surface glabrous to hirsute, lower surface glabrous or very rarely pubescent, ciliate, glaucous; inflorescence axial, the peduncles only slightly elongated at maturity, each peduncle terminated by a modified scorpioid cyme; pedicels 1–10 mm. long, glabrous or papillate; calyx 3–8 mm. long, slightly accrescent, glabrous, ciliate, divided almost to the base, lobes lanceolate to lanceolate-triangular, acute; corolla-tube 7–14 mm. long, glabrous within, the basal glands usually well developed; corolla-limb 5–9 mm. long, moderately expanded; anthers 1.5–2.5 mm. long, shorter and narrower than the filaments which are 4–5 mm. long; fornices prominent, glabrous or short-pubescent; style about as long as or exceeding the corolla; nutlets about 4 mm. long, rugose.

Distribution: central Washington to eastern and south-central Oregon.

WASHINGTON: below Blewett Pass on the west side, near Cle Elum, May 24, 1933, *Nelson & Nelson 667* (M); open flat, Teanaway River Valley, 10–15 miles north of Cle Elum, June 10, 1933, *Quick 1030* (UCal, CAS); dry open hillsides, 2 miles south of Lauderdale Auto Camp, April 18, 1931, *Thompson 6027* (US, G, NY, M); open rimrock near Lauderdale Auto Camp, May 2, 1931, *Thompson 6207* (M, G); moist shade of trees north of Ellensburg, May 2, 1931, *Thompson 6211* (M, G, US, F); open ground along the Teanaway Valley, alt. 2500 ft., May 16, 1931, *Thompson 6345* (G, M, NY); sage-brush slopes near Ellensburg, April 23, 1932, *Thompson 8220* (M, NY, G, UCal); moist open meadows on Tumwater Mountain, alt. 3500 ft., May 12, 1934, *Thompson 10441* (Pom, G, CAS); moist sage-brush slopes between Ellensburg and Cle Elum, April 27, 1935, *Thompson 11422* (G, CAS); in and near the Cascade Mountains of Kittitas, Chelan and King Counties, coll. of 1889, *Vasey 402* (P, US TYPE *M. ambigua*); on wet land, along Caribou Creek, east of Ellensburg, May 5, 1896, *Whited 4* (US); April 25, 1897, *Whited 52* (N); damp thicket at Ellensburg, April 25, 1897, *Whited 307* (P, US TYPE *M. infirma*).

OREGON: Couger Peak, alt. 1900 m., Aug. 3, 1896, *Coville & Leiberg 207* (US); around the little mining town of Sparta, coll. of 1880, *Cusick 856* (ANS, G, F, US); dry mountains, especially among low brush at Sparta, near Snake River, May 23, June 3, 1898, *Cusick 1886* (Cl, F, Pom, G TYPE, M, P. US, ND, UCal); wet banks of Ochoco Creek near the source in Blue Mountains, Crook Co., June 10, 1902, *Cusick 2807* (P, F, UCal, Cl, Pom, G, M); rocky slope, Williams Ridge, Blue Mountains, Wenaha Forest Reserve, Columbia Co., July 9, 1913, *Darlington 2* (P); high moist slope of Crane Mountain, 12 miles southeast of Lakeview, alt. 2500 m., July 11, 1927, *Peck 15578* (Willm).

The material referred to this species, although not abundant, shows several minor variations. When more material is available one of these may be found to be deserving of varietal recognition. Johnston referred *M. ambigua* to the inclusive "*M. paniculata* var. *subcordata*" as a synonym. However, it belongs with *M. umbratilis*.

This species should possibly be placed closer to *M. oblongifolia* var. *nevadensis* than is here done. Its affinity seems to be more with that variety than any of the tall species. It seems to form a link between the tall and the low species.

14. Mertensia lanceolata (Pursh) A. DC. in DC., Prodr. **10**: 88. 1846.

M. marginata G. Don, Gen. Hist. **4**: 319. 1838.

M. linearis Greene, Pittonia **3**: 197. 1897.

M. papillosa Greene, *l.c.* 261. 1898.

M. lanceolata var. *aptera* Ckll. in Macbr., Contr. Gray Herb. N. S. No. 48: 16. 1916.

Pulmonaria lanceolata Pursh, Fl. Am. Sept. **2**: 729. 1814.

P. marginata Nutt., Gen. **1**: 115. 1818.

Casselia lanceolata Dumort., Com. Bot. 24. 1822.
Lithospermum marginatum Spreng., Syst. **1**: 547. 1825.
Cerinthodes lanceolatum O. Kuntze, Rev. Gen. Pl. pt. 2: 436. 1891.

Stems erect or ascending, usually several from each rootstalk, 1–4.5 dm. tall; basal leaves usually ovate-lanceolate, 3.5–14 cm. long, 1.3–4 cm. broad, short-strigillose, pustulate or glabrous above, glabrous below, 1–7 parallel-veined, petiole longer or shorter than the blade; cauline leaves linear to broadly lanceolate or oblong-elliptical, acute or obtuse, 1.5–10 cm. long, 0.2–3 cm. broad, pubescence as of basal leaves, parallel nerves very obscure or not at all apparent, sessile, often semiamplexicaul, becoming smaller toward the inflorescence; pedicels glabrous to strigose, 1–20 mm. long; inflorescence a modified scorpioid cyme, usually congested at first but becoming panicled in age; calyx 2–9 mm. long, the lobes 1–6 mm. long, lanceolate to triangular, ciliate, glabrous on the back or rarely with a few hairs, acute or obtuse, accrescent, a definite tube usually present; corolla-tube 3–6.5 mm. long (mostly 4.5–5.5 mm.), usually with a dense ring of hairs near the base within; corolla-limb 2.5–9 mm. long (mostly 5–6 mm.), subequal to or usually slightly longer than the tube, usually campanulate and much expanded; anthers 1.5–2 mm. long, usually curved, shorter and narrower than the expanded portion of the filaments which are 2–4 mm. long; fornices more or less conspicuous, glabrous to

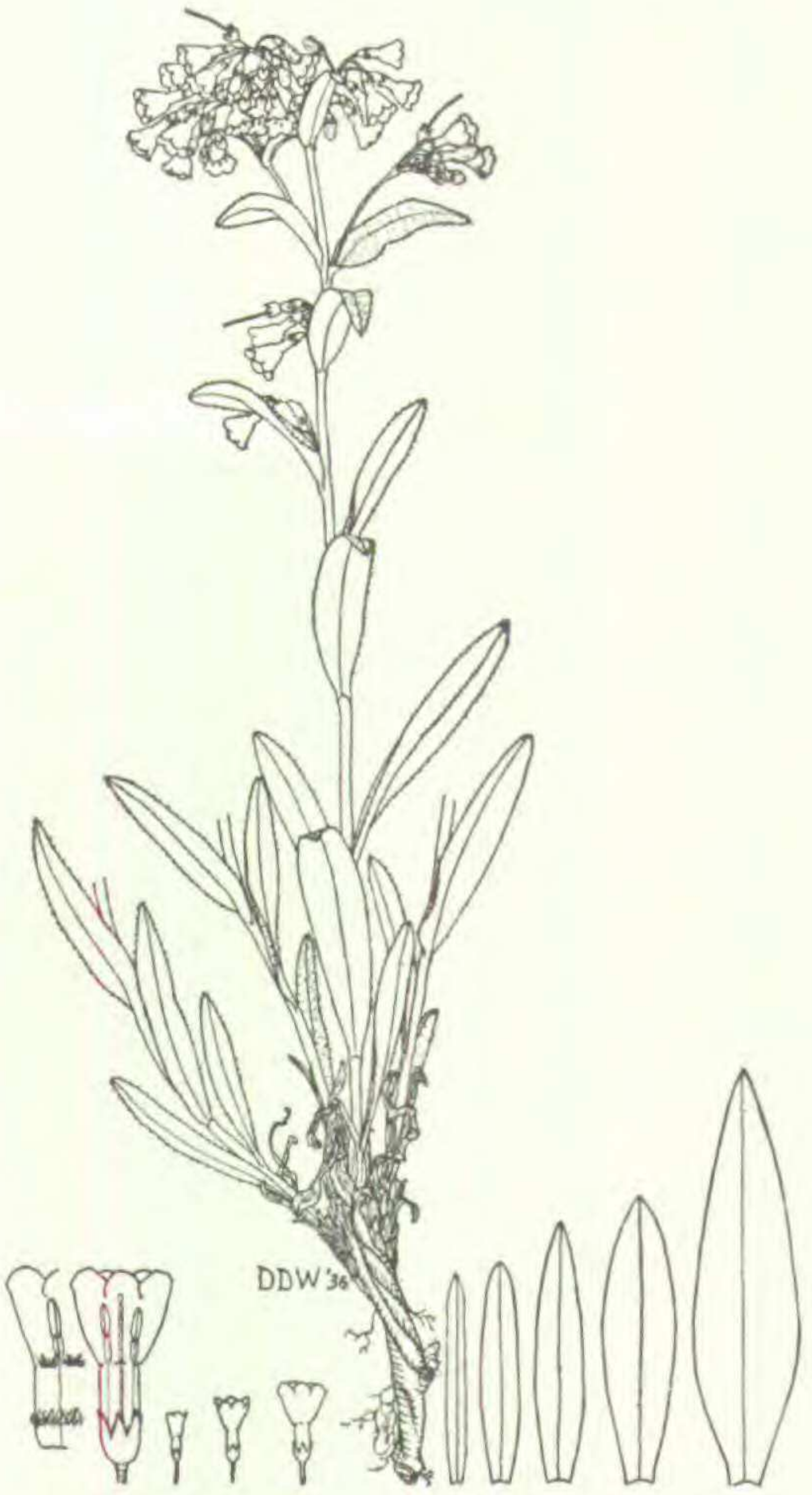

Fig. 8. *M. lanceolata.* Habit sketch × ⅓; variation in leaves and flowers × ⅓; enlarged corolla × 1.

pubescent; style shorter or longer than the corolla; nutlets 2.5–3 mm. long, mostly evenly rugose on the backs and laterally; scar and raised attachment twisted to one side, black at maturity.

Distribution: North Dakota, southern Saskatchewan, and Montana, south to northern New Mexico.

NORTH DAKOTA: moist lumber yard, Portal, June 13, 1903, *Barber 333* (G); on shaded bank in ravine, Medora, June 1, 1912, *Bergman* (M); in deep loam, Williston, May 2, 1906, *Lunell* (Ry); Minot, Ward Co., June 5, 1909, *Lunell* (Ry, ND, O); ravines and plains, Medora, May 29, 1904, *Waldron 2318* (Ry).

SOUTH DAKOTA: "Louisiana,"[1] *Bradbury* (ANS, M photograph); hillsides, Whitewood, Lawrence Co., May 25, 1921, *Brigham 13753* (US); eight miles north of Bellefourche, Butte Co., 900 m., June 11, 1916, *Eggleston 12523* (US); near Ft. Meade, Black Hills, coll. of 1887, *Forwood 267* (US); along Spring Creek near Quashnich farm, Artas, June 8, 1929, *Hanna 148* (M); Ft. Pierre, May 7, 1892, *Harper & Harper* (F); common on high prairies from Ft. Pierre to Bad Lands, June 28, 1853, *Hayden* (M); east facing, red foothills, Rapid City, June 12, 1927, *Hayward 746* (Ry); wooded ridges, Custer State Park, Black Hills, June 14, 1927, *Hayward 901* (Ry); red foothills, Hermosa, June 14, 1927, *Hayward 940* (Ry); open park, 6 miles east of Deadwood, June 17, 1927, *Hayward 995* (Ry); red foothills, Sturgis, June 17, 1927, *Hayward 1038* (Ry); south facing slope, meso-canyon, Whitewood, June 21, 1927, *Hayward 1252* (Ry); west facing slope, Spearfish Canyon (Lower), June 23, 1927, *Hayward 1369* (Ry); limestone plateau, 1 mile from Hardy Station, June 25, 1927, *Hayward 1423* (Ry); meso-canyon, Spearfish Canyon (Upper), June 25, 1927, *Hayward 1435* (Ry); mountain slopes, Custer Peak, Black Hills, July 1, 1927, *Hayward 1763* (Ry); mountain slopes, Terry Peak above Trojan, July 4, 1927, *Hayward 1878* (Ry); mountain slopes, Needles Trail, Harney Peak region, July 8, 1927, *Hayward 1934* (Ry); hillside, Rapid City, April 19, 1925, *Lee 526* (Ry); grassy hillside near Rapid City, April 24, 1925, *Lee 530* (Ry); hillside, Rapid City, April 25, 1925, *Lee 538* (Ry); prairie, Chamberlain, Brule Co., May 30, 1925, *Lee 557* (Ry); along Squaw Creek, State Game Lodge, June 27, 1924, *McIntosh No. V* (Ry); in shade, along stream, Erskine, June 1, 1924, *McIntosh 148* (Ry); abundant in moist humus, on north side of boulder, Castle Creek valley, 1 mile west of Deerfield, June 26, 1925, *McIntosh 690* (Ry); slate, park at head of Willow Creek, Black Hills National Forest, alt. 5200 ft., May 16, 1908, *Murdoch 3023* (F, G); meadow, North Rapid Ranger Station, Black Hills National Forest, alt. 5600 ft., July 12, 1908, *Murdoch 3069* (F); "Upper Louisana," *Nuttall* (ANS); hillsides near Whitewood, Lawrence Co., May, 1922, *Over 14372* (US); high altitude, Lawrence Co., June 29, 1928, *Over 17613* (Ry); Silver City, Pennington Co., July 16, 1929, *Over 18092* (Ry); rocky shaded ground, in canyon, near Sturgis, Lawrence Co., June 8, 1929, *Palmer 37035* (NY, G, M); rocky ground along Boulder Creek, near Deadwood, Lawrence Co., June 11, 1929, *Palmer 37158* (G);

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[1] Collected "opposite the Aricara Village" which would be about opposite Campbell, Campbell Co., South Dakota. Bradbury was at that locality from June 12 to June 18, 1811. This specimen, which bears the name "*Pulmonaria lanceolata*" in Pursh's handwriting, is possibly the historical type.

moist ground along small stream, near Pactolla, Pennington Co., June 17, 1929, *Palmer 37355* (G, M); Piedmont, June, 1895, *Pratt* (Ry); prairie, Newell, May 12, 1913, *Rydberg 11* (F, M, Ry, G); Rockford, Black Hills, alt. 5500–6000 ft., July 11, 1892, *Rydberg 897* (US); Custer, Black Hills, alt. 5500 ft., May 30, 1892, *Rydberg 899* (US, N); Sylvan Lake, Black Hills, alt. 7000 ft., July 19, 1892, *Rydberg 900* (US, N); Short Pines, Harding Co., June 10, 1911, *Visher 473* (Ry); Perkins Co., June 10, 1912, *Visher 565* (Ry); Rockerville, Black Hills, June, 1909, *White* (ND, M).

NEBRASKA: Teton River, April 20, 1853–4, *Hayden* (M); Lawrence Fork, Banner Co., July 8, 1891, *Rydberg 257* (US); War Bonnet Canyon, alt. 5000 ft., June, 1890, *Williams* (M).

SASKATCHEWAN: Wood Mountain, Assiniboia, June 6, 1895, *Macoun 11838* (US, G); Estevan, June 22, 1907, *Cowles 16* (F).

MONTANA: Westby, June 16, 1927, *Larsen 12* (G, M, ANS).

WYOMING: Newcastle, June 19, 1896, *Bates* (N); Cheyenne, May 18–24, 1916, *Bates & Eastman 183, 202* (N); Laramie Hills, May 22, 1892, *Buffum 645* (Ry); east of Laramie, Laramie Mountains, alt. 8000 ft., June 18, 1909, *Cary 308* (US); Cheyenne, May 20, 1874, *Cleburne 25* (N); in *Rhus trilobata* thicket, north slope of Casper Mountain, 5 miles south of Casper, alt. 7000 ft., July 8, 1933, *Hermann 4615* (G); Corlett, June 24, 1907, *Johnson 128* (M); south slope of Ferris Mountain, July, 1928, *Morgan* (Ry); hillside, Hanna, May 20, 1922, *Morgan* (Ry); Laramie Hills, May 16, 1894, *Nelson 34* (ANS, G, Ry, US, ND designated TYPE of *M. linearis*, M, Cl); Laramie Hills, May 18, 1895, *Nelson 1234* (O, Ry); Laramie Hills, June 6, 1896, *Nelson 1904* (F, O, M); Telephone Canyon, May 29, 1897, *Nelson 2936* (F, UCal); Laramie Hills, June 16, 1897, *Nelson 3174* (Ry); stony slopes, Chug Creek, Albany Co., June 30, 1900, *Nelson 7332* (G, US, Ry, M, N); creek bottoms, Camel Rock, Albany Co., July 4, 1924, *Nelson 10623* (UCal, Ry); moist hillsides, Plumbago Canyon, Albany Co., June 5, 1930, *Nelson 11306* (G, UCal, M, Ry); Lusk, June, 1914, *Overton* (Ry); sandy soil in open woods, 5 miles northwest of Hulett, Crook Co., alt. 4500 ft., May 16, 1935, *Ownbey 555* (M); moist sandy soil in open pine woods, 5 miles northwest of Hulett, Crook Co., alt. 4000 ft., May 24, 1935, *Ownbey 555a* (M, W.); Happy Jack Canyon, Laramie Mountains, Albany Co., June 6, 1930, *Porter 514* (M, W); common on open hillsides, Happy Jack Canyon, Laramie Mountains, Albany Co., June 2, 1932, *Porter 1036* (M, W); open sagebrush hillsides, Happy Jack Canyon, Laramie Mountains, Albany Co., June 8, 1933, *Porter 1292* (W); foot of Telephone Canyon, Laramie Mountains, Albany Co., alt. 7500 ft., May 23, 1934, *Porter 1460* (W, M); Happy Jack Canyon at Tie City Camp Ground, Albany Co., May 23, 1934, *Porter 1461* (W, Willm, M); Cheyenne, May, 1870, *Porter* (F); Box Canyon, upper Wagon Hound Creek, Converse Co., June 6, 1931, *Rollins 25 in part* (W); in rocky gulch east of Laramie, June 7, 1902, *Sellon 42* (Ry); Floral Canyon, 4 miles east of Laramie, Albany Co., alt. 7500 ft., May 21, 1931, *Williams 122* (W); grassy hillside, Middle Crow Creek, Albany Co., May 25, 1931, *Williams 155* (W); granitic hillside, Happy Jack Canyon, Albany Co., alt. 8000 ft., June 6, 1934, *Williams 1717* (W, ND, P, M); granitic hillside in shade, Happy Jack Canyon, Albany Co., alt. 8500 ft., June 6, 1934, *Williams 1731* (W, ND, P, M); dry hillside, Roger's Canyon, 8 miles northeast of Laramie, Albany Co., alt. 7500 ft., June 13, 1935, *Williams 2181* (M, ND, P, W); limestone hillside near city spring, Laramie, Albany Co., alt. 7000 ft., June 13, 1935, *Williams 2187* (M, ND, P, W); granitic hillside among sage, Happy Jack Canyon, Laramie Hills, Albany Co., alt. 8500 ft., June 14, 1935, *Williams 2202* (M, ND, P, W); base of a ledge, Telephone Canyon, east of Laramie, Albany Co., alt. 7500 ft., June 18, 1935, *Williams 2220* (M, W); among sagebrush, Happy Jack Canyon, Laramie Hills, Albany Co., alt. 8500 ft., June 18, 1935, *Williams 2221* (M, ND, P, W); plains 5 miles south of Cheyenne, Laramie Co., alt. 6500 ft., June 21, 1935, *Williams 2239* (M, ND, P, W).

COLORADO: mesas, Boulder, alt. 5600 ft., coll. of 1904, *Andrews 26* (Ry); foothills west of Ft. Collins, alt. 5500 ft., April 28, 1896, *Baker* (M); coll. of 1867, *Barthoud* (US); Manitou, Aug. 17, 1916, *Bates 6518½* (N); Boulder, May 18, 1916, *Bates & Eastman 163* (N); Clear Creek, June 14, 1916, *Bethel 25* (CAS); moist open ravine facing northwest on bluff of Clear Creek, 44th Street and Clear Creek, Denver, June 11, 1921, *Bethel, Clokey & Schmoll 258* (C); west Mt. Valley, Fremont Co., Aug., 1873, *Brandegee 651* (UCal, M); alpine, Sangre de Cristo Range, Aug., 1873, *Brandegee 654* (M); region of Pike's Peak, July–Aug., 1912, *Brumback & Davies 123* (F); slopes of Cheyenne Mountain, Colorado Springs, June 20, 1912, *Churchill* (M); rocky hill, Brookvale, Clear Creek Co., June 11, 1918, *Churchill* (G, M); dry soil, Eldorado Springs, alt. 5300 ft., June 24, 1917, *Clokey 2774* (Ariz, F, CAS, Clokey, O, G, Ry); hillsides, Idaho Springs, alt. 8000 ft., July 6, 1917, *Clokey 2785* (F, CAS, G, NY, Ariz, Clokey, O, M, Ry); dry soil, Bear Creek Canyon, alt. 5500 ft., May 19, 1918, *Clokey 3044* (UM, M, Ry, Clokey, CAS, G); dry soil, Bear Creek Canyon, alt. 5500 ft., May 19, 1918, *Clokey 3045* (CAS, US, O, Clokey); prairie, Mymon, Jefferson Co., alt. 5500 ft., May 25, 1918, *Clokey 3078* (Ry, M, G, UM, CAS, Clokey); woods, Lake Eldora, Boulder Co., alt. 9300 ft., July 17, 1918, *Clokey 3160* (CAS, NY, G, Ry, O, Clokey, M); dry open hills, Victor, Teller Co., alt. 3200 m., July 3, 1920, alt. 2750 m., fruit, July 30, 1920, *Clokey 3852* (F, CAS, G, UCal, M, Clokey, ANS, Ry, UM, P, NY); open pine woods, Tolland, Gilpin Co., alt. 2715 m., July 15, 1920, *Clokey 3853* (F, CAS, G, P, US, Clokey, Ry, ANS, M, UM); Boulder, May 18, 1909, *Cockerell 6256* (C); in gravel, Clear Creek Canyon, alt. 9000 ft., June 15, 1873, *Coulter* (NY); Horse Shoe Mountain, July 13, 1873, *Coulter* (US); Howe's Gulch, April 17, 1890, *Crandall 155* (FC); bank of stream, Platte Canyon, alt. 6500 ft., May 9, 1894, *Crandall 360* (US); hills, north of La Porte, May 7, 1898, *Crandall 1635* (N, UM, Ry, F, P, FC); gulch west of Soldier Canyon, May 27, 1898, *Crandall 1636* (FC); plains, Boulder, alt. 5600 ft., June 16, 1906, *Daniels 14* (M); Rocky Mountain National Park, July, 1926, *DeFrance* (Cl); St. Vrain Creek, June 9, 1906, *Dodds 1851* (C); Mesa-Fossil Creek, June 15, 1906, *Dodds 1925* (C); in woods, Valverde, Denver, May, 1887, *Eastwood* (C); Steamboat Springs, July, 1891, *Eastwood* (C); Boulder, June 7, 1916, *Eastwood 5488* (CAS); Trinidad, June 13, 1916, *Eastwood 5543* (CAS); Buena Vista, June 18, 1918, *Eastwood 7082* (US, CAS); rocky valley of Spring Creek above Idaho, July 31, 1874, *Engelmann* (M); grassy places, Empire, Aug. 21, 1874, *Engelmann* (M); grassy dry places, Empire City, Aug. 18, 1881, *Engelmann* (M); Palmer Lake, May 16, 1901, *Ferril* (C); Webster, June 5, 1902, *Ferril* (C, Clokey); La Veta Pass, June 21, 1902, *Ferril* (C); Berkeley Hills and Clear Creek, Denver, May 14, 1903, *Ferril* (C); dry brush, Palmer Lake, May 28, 1903, *Ferril* (C); moist soil, Boulder Canyon, June 8, 1903, *Ferril* (C); moist soil, Castle Rock, June 20, 1903, *Ferril* (C, Clokey); hillsides on the Platte and Clear Creek to the middle mountains, April 20, 1870, *Greene 303* (G); in forest of lodge-pole pine but at base of solitary relict of Douglas fir, Boulder Park, alt. 9000 ft., July 2, 1917, *Hall 10387* (G, UCal); coll. of 1862, *Hall & Harbour 445* (G, M); infrequent, slopes, Gregory Canyon near

Boulder, alt. 5600 ft., May 9, 1920, *Hanson C293* (M); Buena Vista, alt. 7500 ft., June, 1886, *Harper* (F); Manitou, El Paso Co., alt. 6900 ft., May 8, 1897, *Heller & Heller 3501* (M, US); Rist Canyon, May 11, 1923, *Hendricks* (FC); Howe's Gulch, May 25, 1899, *Herb. Colo. State Agric. Coll. 4157* (UM, P, N, Ry); Clear Creek near 44th Avenue, Denver, June 14, 1916, *Huestis* (C); near Estabrook, in Platte Canyon, 52 miles from Denver, on the South Park Line of the Union Pacific Railway, alt. 7500 ft., June 10, 1896, *Holzinger* (FC); bluffs, South Park, flowers May 28–fruit July 12, 1892, *Hughes 1* (G); central Colorado, coll. of 1907, *Johnson 460* (Ry); bluffs, Grover, May 24, 1926, *Johnston 83, 197* (M, Ry); Lyons, Boulder Co., May 24, 1916, *Johnston 374B* (M, UCal); ravine near gap, Stonewall, June 17, 1917, *Johnston 534* (M); hillsides, Trinidad, June 14, 1917, *Johnston 535* (M); Munro road, Lynn, July 14, 1917, *Johnston 541* (M); on dry grassy opening in brush, Ute Pass Trail near Manitou, alt. 6600 ft., June 17, 1920, *Johnston 2814* (G); hills in Coal Creek Canyon, 10 miles northwest of Golden, July 7, 1917, *Johnston & Hedgcock 529a* (G); in Coal Creek Canyon, 14 miles northwest of Golden, July 7, 1917, *Johnston & Hedgcock 530* (G); hillsides east, Morley, June 16, 1917, *Johnston & Hedgcock 531* (G); ravine near "Stonewall Gap," Stonewall, June 17, 1917, *Johnston & Hedgcock 533a, 543* (G); hills west, Trinidad, June 14, 1917, *Johnston & Hedgcock 535* (G); Cuchara Camps, La Veta, Las Animas and Huerfano Co., June 21, 1917, *Johnston & Hedgcock 539* (G); Miner's Ranch, North Fork of St. Vrain River, Lyons, July 14, 1917, *Johnston & Hedgcock 540, 541* (G); Colorado Springs, May, 1878, *Jones* (US); plains, Colorado Springs, May 3, 1878, *Jones 15* (U); Manitou, Aug. 16, 1884, *Letterman 155* (M, US); top of Raton Pass and Trinidad, May 29, 1931, *McKelvey 2444* (G); east of Fort Garland, before starting to climb La Veta Pass, Costilla Co., alt. 8200 ft., May 30, 1934, *McKelvey 4776* (G); Rocky Mountains, Aug., coll. of 1871, *Meehan* (ANS); borders of copses, Palmer Lake, May 20, 1925, *Nelson 10515* (M, UCal); Estes Park, Larimer Co., July 10, 1917, *Osterhout* (Clokey); foothills, Horsetooth, Larimer Co., April 25, 1895, *Osterhout 631* (O); moraine, Estes Park, Larimer Co., July 20, 1900, *Osterhout 2211* (O); near Livermore, Larimer Co., May 29, 1901, *Osterhout 2396* (O); Malta Station, Lake Co., June 20, 1903, *Osterhout 2797* (O); Sulphur Springs, Grand Co., June 9, 1906, *Osterhout 3249* (O, Ry, G, AM) and *3249B* (O); Moraine Park, Larimer Co., July 10–11, 1917, *Osterhout 5627, 5634, 5635* (O); Long's Peak Inn, Larimer Co., July 12, 1917, *Osterhout 5647* (O, Clokey), and *5648* (O); Palmer Lake, El Paso Co., June 5, 1918, *Osterhout 5723, 5878, 5879* (O); west of Buena Vista, Chaffee Co., June 16, 1926, *Osterhout 6530* (O); moist woods on hillsides, Tolland, alt. 9000 ft., June 23, 1913, *Overholts* (M); rocky ground along small creek, near Colorado Springs, El Paso Co., June 23, 1926, *Palmer 31243* (M); rocky ground, near Tolland, Gilpin Co., June 25, 1926, *Palmer 31395* (M); on gravelly banks, common in the valley of Clear Creek, May–June, 1861, *Parry 284* (M, US); Rocky Mountains, near Georgetown, July, 1873, *Patterson 103* (F); in damp shaded places, near Empire, alt. 8500 ft., July 10, 1885, *Patterson 115* (F, ANS, M); Broomfield, May, 1915, *Phelps* (CAS); Boulder, April 27, 1916, *Philipps* (G, TYPE *M. lanceolata* var. *aptera*); La Veta, coll. of 1907, *Pool* (N); near Boulder, June, 1899, *Ramaley* (C); near Florissant, alt. 2400 m., Aug. 1–8, 1905, *Ramaley 1392½* (C); Pine Cliff, July 14, 1909, *Ramaley 6671* (C); Eldora, Aug. 14, 1912, *Ramaley 9355* (Ry, C); among rocks and on dry grassland, Boulder, June 22, 1913, *Ramaley 9573, 9574* (C); dry grassland, Crescent, July 13, 1914, *Ramaley 9974* (C); dry grassland, Paetolus, Aug. 1, 1914, *Ramaley 10298* (C); dry grassland, Sulphide, June 12, 1915, *Ramaley 10370* (Ry, C); Pine Cliff, June 18, 1915, *Ramaley 10412* (C); Rose Hill, Boulder, May 15, 1916, *Ramaley 10607* (C); Box Elder, June 14, 1907, *Ramaley & Robbins 2717* (C); north Box Elder, alt. 7000 ft., June 8–11, 1907, *Ramaley & Robbins 2828* (C); Wet Mountain Valley, July 23, 1872, *Redfield* (M); open rocky prairie, east of Morrison, May 10, 1923, *Ritter & Schmoll 633* (C); open rocky prairie, east of Morrison, May 10, 1923, *Ritter & Schmoll 634* (C); near Boulder, May 5, 1909, *Robbins 6228* (C); Miramonte, July 2, 1909, *Robbins & Prosser 6394, 6438* (C); plains near Denver, alt. 1500 m., May 8, 1900, *Rydberg & Vreeland 5686* (O, P); Cuchara Valley, near La Veta, alt. 2100 m., May 17, 1900, *Rydberg & Vreeland 5687* (ND, N, O, Ry, P); hills, southeast of La Veta, alt. 2200–2300 m., May 18, 1900, *Rydberg & Vreeland 5695* (Ry, N); Calhan, alt. 7000 ft., July, 1893, *Saunders* (N); alpine, James Peak, Tolland, Aug. 7, 1919, *Schmoll 157* (C); Gullus North Mesa, Colorado Springs, May 28, 1904, *Shantz 31* (N); Clear Creek Canyon, June 5, 1893, *Schneck* (M); base of Cheyenne Mountain, May 3, 1891, *Smith* (M); Lyons, May 23, 1891, *Smith* (M); Berkeley, May 9, 1901, *Smith* (C); near brook in loam, 50 miles east of Montevista, toward La Veta Pass, alt. 8200 ft., May 30, 1934, *Stone 598* (NY); dry prairie, Colorado Springs, El Paso Co., May 14, 1903, *Sturgis* (G); Wet Mountain Valley, Canyon City, Fremont Co., July, 1873, *Tuthill 651* (F); Rico, alt. 10,000 ft., June 15, 1895, *Tweedy 117* (US); Eldora to Baltimore, alt. 8500–9500 ft., June 20–July 10, 1903, *Tweedy 5660, 5662* (Ry); plains and foothills near Boulder, alt. 5000–6000 ft., June, 1903, *Tweedy 5663* (Ry); Rocky Mountains, coll. of 1868, *Vasey 437 in part*[1] (G); Rocky Mountains, coll. of 1868, *Vasey 437B* (M, US); brickyard mesa, Boulder, Boulder Co., May 23, 1913, *Vestal* (M); Gregory Canyon, Boulder, Boulder Co., May 21, 1912, *Vestal 368* (M); Castle Rock, coll. of 1889, *Walker* (F); Rollinsville, alt. 2700 m., July, 1900, *Wheeler 360* (C); borders of *Quercus* copses, 10 miles north of Castle Rock, Douglas Co., June 22, 1935, *Williams 2244* (M, W); moist draw 1 mile south of Palmer Lake, El Paso Co., alt. 6900 ft., June 22, 1935, *Williams 2249* (W, M); moist draw along Highway 71, 15 miles north of Limon, Lincoln Co., June 28, 1935, *Williams 2297* (M, W); dry hillside along Colorado River, Hot Sulphur Springs, Grand Co., July 19, 1935, *Williams 2418* (M, W); north fork of Cache La Poudre River at base of red sandstone cliffs among *Cercocarpus*, Larimer Co., May 21, 1935, *Williams & Williams 2114* (M, W); mouth of Big Thompson Canyon in brush, Larimer Co., May 22, 1935, *Williams & Williams 2131* (M, W); among brush, hillside, Dale Creek, Larimer Co., alt. 7000 ft., May 22, 1935, *Williams & Williams 2132* (M, ND, P, W); granitic open soil near Colo.-Wyo. line, Highway 285, Larimer Co., alt. 7500 ft., May 22, 1935, *Williams & Williams 2141* (M, ND, P, W); Apex, coll. of 1873, *Wolfe 709a* (Cl, F); Littleton, May 28, 1935, *Zobel* (CAS).

NEW MEXICO: summit of grade on Palofleckalo Hill, Sangre de Cristo Range, Taos Co., alt. 9080 ft., June 4, 1934, *Ferguson & Ottley 5303* (G); near top of Palofleckalo Hill in Sangre de Cristo Mountains, alt. 9000 ft., May 28, 1931, *McKelvey 2403* (G); in the Cimarron Mountains, Taos-Cimarron, May 31, 1931, *Nelson 11497* (UCal, Ry).

LOCALITY NOT STATED: "ex regione media montium," alt. 7000–9000 ft., July,

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[1] This collection by Vasey, or the following one, may be type collection of *M. papillosa*. The type could not be located.

1884, *Ball* (G); on prairie, soil dry, upper Missouri, May, 1856, *Culbertson (4)* (G); abundant on the prairie, not confined to hillsides, soil very dry, upper Missouri, May, 1856, *Culbertson (3)* (ANS); Rocky Mountains, Missouri and Oregon, coll. of 1845, *Geyer 24* (Kew); "Missouri," *Nuttall* (ANS TYPE of *M. marginata*, M photo).

14a. **Mertensia lanceolata** var. **secundorum** Ckll. in Torreya **18**: 180. 1918.

M. secundorum Ckll. in Muhlenbergia **3**: 68. 1907.

M. micrantha A. Nels. in Proc. Biol. Soc. Wash. **20**: 37. 1907.

M. media Osterh. in Torreya **17**: 175. 1917.

M. Clokeyi Osterh. in Bull. Torr. Bot. Club **46**: 55. 1919.

Leaves strigose above, strigose to densely hispid below; calyx glabrous to strigose; otherwise as the species.

Distribution: Wyoming and Colorado, often with the species.

WYOMING: Box Canyon, upper Wagon Hound Creek, Converse Co., June 6, 1931, *Rollins 25 in part* (W).

COLORADO: Green Mountain, Estes Park, alt. 8500 ft., Aug. 9, 1933, *Allen 147* (M); dry hillsides, Boulder, coll. of 1904, *Andrews 32* (Ry); open hills, Divide, Teller Co., June 17, 1933, *Applegate 8551* (G); Boulder, May, 1900, *Archibald A156* (C); Pike's Peak, alt. 7000–9000 ft., July, 1884, *Ball* (G); Manitou, Aug. 8, 1916, *Bates 6442* (N); in yard, Manitou, Aug. 18, 1916, *Bates 6534* (N); mountains of Colorado, Aug., 1871, *Canby* (F); summit Genesee Mountain, near Denver, June 8, 1918, *Churchill* (G); Cross Ruxton, alt. 2600 m., June 16, 1901, *Clements & Clements 124* (N, Ry, US, G, M, Cl); hillsides, Idaho Springs, alt. 8000 ft., July 6, 1917, *Clokey 3033* (O, F, G, NY, Clokey, Ry, CAS); dry soil, Bear Creek Canyon, alt. 5500 ft., May 19, 1918, *Clokey 3043* (Clokey, O); hillsides, Apex Canyon, Jefferson Co., alt. 6000 ft., May 25, 1918, *Clokey 3062* (CAS, O, G, M, Ry, NY, Clokey); woods, Lake Eldora, Boulder Co., alt. 9300 ft., July 16, 1918, *Clokey 3161* (CAS, Ry, NY, C, Clokey, O TYPE *M. Clokeyi*, G); openings in pine forest, Jefferson Co., alt. 2280 m., June 12, 1920, *Clokey 3847* (CAS, P, Ry, UM, ANS, M, NY, Clokey, F); Morrison, Jefferson Co., June 22, 1918, *Clokey 5746* (O); dry hillside, Golden-Central City, Jefferson Co., alt. 2440 m., June 9, 1920, *Clokey & Duthie 3846* (P, Clokey); in dry open woods under *Pinus scopulorum*, Florissant, alt. 8000 ft., June 26, 1908, *Cockerell* (Ry); Boulder, May 18, 1908, *Cockerell 6256* (G); Boulder, May 18, 1909, *Cockerell 6257* (C); Estes Park, alt. 9000 ft., July 15, 1904, *Cooper* (AM); Estes Park, alt. 9000 ft., July 15, 1904, *Cooper 110* (Ry); in gravel, Clear Creek Canyon, alt. 9000 ft., June 15, 1873, *Coulter* (US); Palmer Lake, July, 1887, *Eastwood* (C); Golden, May 27, 1916, *Eastwood 5402* (CAS); vicinity of Colorado Springs, El Paso Co., alt. 1800 m., June 19, 1915, *Eggleston 11175* (US); grassy places, Clear Creek Valley, Empire, Aug. 27, 1874, *Engelmann* (M); mouth of Boulder Canyon, May '16, 1907, *Euler* (Ry TYPE); Forks Creek, June 3, 1901, *Ferril* (C, Clokey); Palmer Lake, June 17, 1902, *Ferril* (C); Palmer

Lake, May 28, 1903, *Ferril* (C, Clokey); Boulder Canyon, Boulder, June 8, 1903, *Ferril* (C, O, Clokey); Castle Rock, June 20, 1903, *Ferril* (C, O); open, moist places, Veta Pass, July 4, 1904, *Ferril* (C, Clokey); Sunshine, Boulder Co., coll. of 1885, *Gardner* (G); coll. of 1871, *Greene* (M); Golden City, coll. of 1871, *Greene 613* (G); Rocky Mountains, coll. of 1864, *Hall* (M); Rocky Mountains, coll. of 1862, *Hall & Harbour 134* (G); Rocky Mountains, coll. of 1862, *Hall & Harbour 445* (F); frequent, dry slopes, Ward, alt. 9500 ft., June 25, 1921, *Hanson C295* (M); hills in Coal Creek Canyon, 10 miles northwest of Golden, July 7, 1917, *Johnston & Hedgcock 529* (G); plains, Colorado Springs, May 3, 1878, *Jones 14* (G); Twin Sisters, Larimer Co., alt. 11,000 ft., June 20, 1932, *Kiener* (W); on the Fern Lake Trail, Estes Park, June 20, 1929, *Mathias 396* (Pom); aspen grove in gulch, Rocky Mountain National Park, alt. 8000 ft., July 28, 1931, *Nelson & Ashton 324* (Ry); Moraine, Estes Park, Larimer Co., June 23, 1894, *Osterhout 309* (O); Moraine, Estes Park, Larimer Co., July 20, 1900, *Osterhout 2210* (O); Moraine Park, Larimer Co., July 20, 1903, *Osterhout 2824* (Ry); Palmer Lake, El Paso Co., May 24, 1913, *Osterhout 4882* (NY, O TYPE *M. media);* Moraine Park, Larimer Co., July 10, 1917, *Osterhout 5629* (O, Clokey); Long's Peak Inn, Larimer Co., July 13, 1917, *Osterhout 5652* (O); Palmer Lake, El Paso Co., June 5, 1918, *Osterhout 5722* (Pom, O, C, Ry); Palmer Lake, El Paso Co., June 5, 1918, *Osterhout 5724* (G, O); Palmer Lake, El Paso Co., June 5, 1918, *Osterhout 5725* (C, Ry, NY); from the headwaters of Clear Creek, and the alpine ridges lying east of ''Middle Park,'' coll. of 1861, *Parry 285* (ANS); dry ridges, Empire, June 28–Aug. 7, 1875, *Patterson* (F); vicinity of Georgetown, July 11–Aug. 11, 1876, *Patterson* (F); dry places in Clear Creek Canyon, Georgetown, alt. 8500 ft., July 8 and 27, 1885 *Patterson 115* (M, G, F, UCal); Rocky Mountains, *Peck* (US); Bear Creek Canyon, June 23, 1929, *Phelps* (CAS); dry soil, high ground, north of Nederland, alt. 2500 m., July 1, 1905, *Ramaley 1131* (C); mesa south of Boulder, May 31, 1908, *Ramaley 4826* (C); dry grassland, Smartweed Lake, June 21, 1909, *Ramaley 6309* (C); near Ward, July 19, 1912, *Ramaley 9131* (Ry); Tolland, alt. 9000 ft., July 1, 1916, *Ramaley 10649* (Ry); gulch, near La Veta Pass, June 14, 1928, *Ramaley 12013* (Ry); Sugar Loaf Mountain, July 14, 1906, *Ramaley & Robbins 1750* (C, Ry TYPE *M. micrantha);* at Redrock Lake, about 4 miles west of Ward, alt. 10,000 ft., July 30–31, 1907, *Ramaley & Robbins 3110* (C, Ry); dry grassland, Smartweed Lake, June 15, 1910, *Robbins 7632* (C); Marshall, May, 1909, *Rusk* (US); Veta Mountain, alt. 2400–2700 m., June 4, 1900, *Rydberg & Vreeland 5688* (N, Ry); Ojo, alt. 2400–2500 m., May 26, 1900, *Rydberg & Vreeland 6615* (Ry); Pike's Peak, June 5, 1904, *Schedin & Schedin 315* (Ry); Ute Pass, July, 1904, *Taylor* (ANS); Ute Pass, July 21, 1886, *Trelease* (M); Eldora to Baltimore, Gilpin Co., alt. 8500–9500 ft., June 20–July 10, 1903, *Tweedy 5659* (Ry); plains and foothills near Boulder, Boulder Co., alt. 5000–6000 ft., June, 1903, *Tweedy 5661* (Ry); Douglas Co., coll. of 1892, *Walker* (F); Rollinsville, July, 1901, *Wheeler 358* (C); Pike's Peak auto road, El Paso Co., alt. 7600 ft., June 9, 1922, *Wiegand & Upton 4129* (Cl); moist draw one mile south of Palmer Lake, El Paso Co., alt. 6900 ft., June 22, 1935, *Williams 2249a* (W, M); rocky open hillsides toward base of Pike's Peak, El Paso Co., alt. 7000 ft., June 22, 1935, *Williams 2253* (W, ND, P, M); Clear Creek Canyon, coll. of 1873, *Wolf & Rothrock 709* (ANS); Pike's Peak Trail, alt. 7000 ft., coll. of 1883, *Woodward* (G); Pike's Peak, June 22, 1907, *Wooton* (AM); rocky south slope, near mouth, Boulder Canyon, May 22, 1903, *Young* (F).

14b. Mertensia lanceolata var. **brachyloba** (Greene) A. Nels. in Coult. & Nels., Man. Ry. Mt. Bot. 422. 1909.

M. brachyloba Greene, Pittonia **4**: 90. 1899.

Stems several from each rootstalk, up to 5 dm. tall; leaves glabrous on both surfaces; calyx campanulate, the lobes shorter than the tube, triangular or ovate, obtuse or acute.

Distribution: Larimer Co., Colorado.

COLORADO: foothills near Ft. Collins, Larimer Co., May 24, 1896, *Baker* (Pom, M, AM, F, ND TYPE, Clokey); Log Cañon and Rist Cañon, reached from Ft. Collins, 74 miles north of Denver, on the Union Pacific Railway, alt. 6000–7000 ft., May 31, 1896, *Baker & Holzinger 86* (FC); open meadows, Rocky Mountain National Park, July 4, 1923, *Bebb 3172* (M); North Fork of Big Thompson River, Cliff Crest Cabin, near Estes Park, Larimer Co., July 4, 1935, *Christ 700* (G); Moraine Park, Larimer Co., July 20, 1900, *Osterhout 2211* (Ry); Buckhorn Creek, Larimer Co., June 3, 1916, *Osterhout 5498* (Ry, O, Pom); hillside among brush, mouth of Big Thompson Canyon, 8 miles west of Loveland, Larimer Co., July 17, 1935, *Williams 2409* (W, ND, P, G, NY, O, P, M); in brush, mouth of Big Thompson Canyon, Larimer Co., May 22, 1935, *Williams & Williams 2130* (W, ND, P, G, NY, O, P, M); hillside, Big Thompson Canyon near the mouth, Larimer Co., May 22, 1935, *Williams & Williams 2133* (W, P, ND, M).

14c. Mertensia lanceolata var. **Fendleri** Gray in Proc. Am. Acad. **10**: 53. 1875.

M. Fendleri Gray in Am. Jour. Arts and Sci. II. **34**: 339. 1862.

Calyx usually divided to the middle or less, usually densely strigose but sometimes nearly glabrous; the upper surface of the leaves densely short-strigose, the lower surface glabrous.

Distribution: southern Colorado and northern New Mexico.

COLORADO: Dillon Canyon, Trinidad, June 25, 1897, *Herb. Colo. State Agric. Coll.* (NY); Raton Pass, 13 miles south of Trinidad, Las Animas Co., alt. 8000 ft., June 27, 1922, *Wiegand & Upton 4135* (Cl); hillside among oak in Raton Pass, 14 miles south of Trinidad, Las Animas Co., June 24, 1935, *Williams 2272* (M, ND, P, G, NY, O, P, W).

NEW MEXICO: Santa Fe Canyon, May, 1904, *Bartlett* (AM); Dillon Canyon, June 25, 1897, *Berg 4792* (FC); near Las Vegas, *Cockerell* (US); Trout Spring, Gallinas Canyon, May 24, 1902, *Cockerell 57* (NY); Trout Spring, Gallinas Canyon, May 24, 1902, *Cockerell & Cockerell 82* (Ry); among bushes, Balsam Park, Sandia Mountains, alt. 8200 ft., April 11, 1914, *Ellis 12* (M); foot of hills at some distance from water, Santa Fe Creek bottom, April 26–June 3, 1847, *Fendler 625* (ANS, M, G TYPE); Santa Fe Canyon, 9 miles east of Santa Fe, alt. 8000 ft., June 2, 1897, *Heller & Heller 3640* (Pom, ND, M, G, P, Cl); Bear Canyon, June, 1898, *Herrick 200* (AM); Bear Canyon, May, 1898, *Herrick 260 in part* (AM).

14d. Mertensia lanceolata var. **pubens** (Macbr.), comb. nov.
M. amplifolia Woot. & Standl. in Contr. U. S. Nat. Herb. **16**: 165. 1913.
M. Fendleri var. *pubens* Macbr. in Contr. Gray Herb., N. S. No. 48: 14. 1916.

Similar to the var. *Fendleri* except the leaves pubescent on the lower surface.

Distribution: northern New Mexico and adjacent Colorado.

Colorado: Veta Pass, *Hicks* (G); top of La Veta Pass, alt. 9382 ft., May 30, 1934, *McKelvey 4820* (G); on sandstone gravel, 61 miles east of Montevista, La Veta Pass, alt. 9100 ft., May 30, 1934, *Stone 607* (NY).

New Mexico: Santa Fe, June, 1921, *Anect 23* (US); Holy Ghost Canyon, below Cowles, July 5, 1931, *Castetter 1075* (Ry); Pecos River, June 16, 1898, *Coghill 4* (M); Bear Canyon, May, 1898, *Herrick 260 in part* (AM); Santa Fe Mountains, June 16, 1898, *Maltby & Coghill 4* (AM); Winsor's Ranch, Pecos River National Forest, alt. 8400 ft., June 29, 1908, *Standley 4023* (AM, NY, G type, M, CAS); damp meadow along Winsor Creek, Pecos River National Forest, alt. 8400 ft., *Standley 4135* (AM); 5 miles above Mora, Rio de la Casa, Mora Co., alt. 2135 m., May 30, 1902, *Sturgis* (G); Glorietta, June, 1881, *Vasey* (G, ND, US type *M. amplifolia);* rich soil, Raton road, 19 miles east of Taos, Colfax Co., alt. 8000 ft., June 5, 1922, *Wiegand & Upton 4128* (Cl).

Mertensia lanceolata and its varieties well demonstrate the difficulty that has been had with the western members of the genus. No less than thirteen names have been used for this plant and its variations. Essentially, as here understood, the plants concerned are five phases of the same species. Two of these, the var. *Fendleri* and var. *brachyloba,* seem to be fairly good varieties on sound morphological ground.

Mertensia lanceolata was first collected by Bradbury and, possibly at the same time, by Nuttall. These collections were made near the northern limit of its range. The specimen collected by Bradbury, and later described by Pursh as *Pulmonaria lanceolata,* is the phase of the species with the upper surface of the leaf strigillose. Nuttall renamed the plant a few years later, stating that Pursh's name was not appropriate, calling it *Pulmonaria marginata.* He gave a good description of it based on a plant collected by himself. The specimen which he "starred," thus indicating it to be a new species, is the phase of the species lacking the strigillose pubescence of the specimen on which Pursh's name is based. The plant, as

Nuttall described it, is the one which most authors have taken to represent typical *M. lanceolata.* The intergradation of these two phases is so complete through most of the range of the species that there seems no reason for separating them.

Mertensia lanceolata var. *secundorum* is a phase of the species in which both surfaces of the leaf are pubescent. This pubescence may either be scant and appressed or very dense and spreading. The stem and calyx may also be pubescent, or they may be essentially glabrous. The biological status of the variety is doubtful. It was found growing intermingled with the species in the field several times and, judging from the number of herbarium sheets on which the two are mixed, their growing together must be of common occurrence.

Mertensia lanceolata var. *brachyloba* is rather limited in its range and in the field is a rather striking variation. It was found growing intermixed with the species. When the hillside where the two grew together was first visited the species was in full flower and the variety was just in bud. At a later date the species was starting to fruit and the variety was in full flower. About a month later the variety was just shedding its seeds while the species had died down and no trace of it could be found. The variety is noticeably more robust and has slightly larger flowers in addition to the campanulate shape of the calyx on which it is separated.

Mertensia lanceolata var. *Fendleri* might be considered as a fairly distinct species if it were not for the fact that intergrades can be found in the same patch which tend to close the "gap" between the species and variety. Abundant herbarium material affords all stages of intergradation.

Mertensia lanceolata var. *pubens* is a further phase of var. *Fendleri* with the leaves pubescent on both sides. It apparently has the same relation to var. *Fendleri* as var. *secundorum* does to the species.

A word need be said concerning the variation in size of flowers and size and shape of leaves in the species and its varieties. Flowers of extreme sizes seem to be due in the main to at least two conditions. First, flowers which come out first tend to be of normal size, but if the plant continues to flower for an abnormally long period the flowers tend to be much smaller. It is also noticed that specimens bearing these small flowers usually have the majority of the inflorescences well along in fruit. Second, position in the inflorescence may account for some variation in size. Plants in the northern part of the range have the flowers averaging slightly larger than those further south. Variation in shape of leaves is rather great but of little or no diagnostic value. Leaves continue to widen through the active life of the plant and may be twice as wide at time of fruiting as they were at flowering time.

15. **Mertensia fusiformis** Greene, Pittonia **4**: 89. 1899.
M. congesta Greene, Pl. Baker. **3**: 17. 1901.
M. papillosa fusiformis A. Nels. in Coult. and Nels., Man. Ry. Mt. Bot. 421. 1909.

Stems erect or nearly so, 1–3 dm. high, glabrous or sparingly pubescent, 1–few from each rootstalk which is usually rather large and fusiform; basal leaves elliptic to oblong-ovate, 4–12 cm. long, 1.5–3 cm. broad, usually densely strigose above, glabrous below, petiole (so far as known) 7–12 cm. long; cauline leaves linear-oblong to ovate-oblong, 1.5–10 cm. long, 0.4–3 cm. broad, sessile or the lowermost short-petiolate, more or less densely strigose above, glabrous below, usually quite obtuse, rarely somewhat acute; inflorescence usually congested, sometimes slightly panicled; pedicels 1–15 mm. long, densely strigose; calyx 3–6 mm. long (mostly 4–5 mm.), slightly accrescent, the lobes lanceolate to lanceolate-ovate, 2–5 mm. long, acute, ciliate, usually pubescent on the backs, occasionally nearly glabrous, not divided to the base; corolla-tube 4–7 mm. long, with a ring of crisp hairs within at the base; corolla-limb 5–7 mm. long, moderately expanded, usually subequal to or shorter than the limb, but sometimes longer; anthers 1.5–2.5 mm. long; filaments 1–3 mm. long, longer or shorter than the anthers; fornices present but usually not conspicuous, glabrous or nearly so; style usually surpassing the anthers, sometimes shorter; nutlets rugose, about 3 mm. long.

Distribution: Wyoming, Colorado, and Utah, in the mountains.

WYOMING: along small stream, 20 miles west of Big Piney, Sublette Co., July 9, 1922, *Payson & Payson 2612* (Ry, M, G, US); dry slopes, Wyoming Range, 15 miles west of Merna, Sublette Co., July 18, 1922, *Payson & Payson 2749* (Pom, F, UCal, ANS, M, O, Ry, US).

COLORADO: Poverty Ridge, above Cimarron, alt. 8500 ft., June 13, 1901, *Baker 129* (US, Ry, G, P, M, UCal, ND TYPE *M. congesta*, Pom); Graham's Peak, alt. 8000 ft., May, 1899, *Baker 558* (M, Ry, US, G, UCal, ND, Pom); open glades, Bob Creek, West La Plata Mountains, alt. 10,000 ft., June 28, 1898, *Baker, Earle & Tracy 206* (G, M, N, ND TYPE, AM, Ry, Cl, US, M, UCal, F, Pom); Cimarron, alt. 7000 ft., May 19, 1898, *Crandall 1637* (FC); Durango, May 23, 1916, *Eastwood 5365a* (CAS); vicinity of Mt. Carbon, Gunnison Co., alt. 2750 m., June 11, 1910, *Eggleston 5669* (US); Durango, May 11, 1906, *Ferril* (C); Rico, May 15, 1906, *Ferril* (C); among sage, juniper, and pinyon, head of Deep Channel Creek, alt. 6400 ft., June 4, 1935 *Graham 9114* (Carnegie, M, W); top of Wolf Creek Pass at Continental Divide, alt. 10,800 ft., May 28, 1934, *McKelvey 4764* (G); warm sandy soils, entrance of Mesa Verde Park, May 12, 1925, *Nelson 10427* (M, G, Ry, UCal); in open pine woods, Durango, May 13, 1925, *Nelson 10444* (Ry, G, M, UCal); sandy soils, among junipers, Mesa Verde Park, May 12, 1925, *Nelson 10429* (M, G, Ry, UCal); steep brushy slopes, Cumbres Pass, May 16, 1925, *Nelson 10474* (UCal); open slopes, Tebaguache Basin, alt. 8000 ft., June 3, 1914, *Payson 376* (F, Ry, C, G, M); southern foothills on a mountain, on Tongue Creek, Mesa Grande, alt. 7000–8000 ft., May, 1892, *Purpus 139* (F); on mountain meadows, vicinity of Mt. Carbon, alt. 2700 m., May 26, 1910, *Tidestrom 3426* (US); Cripple Creek, alt. 10,500 ft., May 15, 1895, *Tweedy 118* (US); near Crawford, Delta Co., alt. 6500 ft., April 26, 1902, *Warren 999* (US); Montezuma Forest Reserve, coll. of 1907, *Wheeler 4793* (C).

UTAH: La Sal, San Juan Co., June 17, 1927, *Cottam 002270* (F); Elk Ridge, 20 miles west of Blanding, San Juan Co., May 7, 1933, *Harrison 5895* (M); sandy creek bottom, four miles south of Moon Lake, Ashley Forest, Duchesne Co., alt. 7600 ft., June 13, 1934, *Harrison & Larsen 7618* (M); moist hillsides, Dyer Mine, Uinta Mountains, June 30, 1902, *Goodding 1222* (F, Pom, UCal, G, N, M, Ry, Cl); Taylor Mountain, 15 miles north of Vernal, Uinta Basin, Uintah Co., alt. 8500 ft., June 24, 1931, *Graham 6303* (M, Carnegie); in sagebrush flat under cottonwoods along river, White Rocks Canyon, Uinta Basin, Uintah Co., alt. 7300 ft., May 23, 1933, *Graham 7806* (W, Carnegie, M); in aspen-pine meadow, Uinta River Canyon, Uinta Basin, Duchesne Co., alt. 7500 ft., June 2, 1933, *Graham 8067* (W, Carnegie, M); summit, Grouse Creek Canyon, north slope of north rim of Uinta Basin, Daggett Co., alt. 7000 ft., June 6, 1933, *Graham 8099* (W, Carnegie, M); Counting Corral, Pot Creek road, northeast of Little Brush Creek Knob, 20 miles northeast of Vernal, Uinta Basin, Uintah Co., alt. 9500 ft., June 7, 1933, *Graham 8120* (W, M, Carnegie); meadow at Trout Creek Ranger Station, 10 miles northeast of Marsh Peak, Uinta Basin, Uintah Co., alt. 9300 ft., June 20, 1933, *Graham 8198* (W, M, Carnegie); Wilson Mesa near Moab, May 29, 1915, *Jones* (CAS, UCal); open hillsides, Summit Springs Ranger Station, Uinta Mountains, Daggett Co., alt. 9000 ft., June 8, 1932, *Williams 564* (CAS, W, Ry, M, U).

Mertensia fusiformis seems to be most closely allied to *M. lanceolata* var. *Fendleri* and may possibly have originated at about the same place in the series. Some specimens are difficult to distinguish from that variety, but on the whole the species *fusiformis* is fairly distinct. If it is to be considered a member of this small series, comprising *lanceolata* and its varieties, which it probably is, it is the most western of the group and the only one which crosses the Rockies. As noted under the discussion of *M. brevistyla,* this species may have given rise to *M. brevistyla* and even though *M. brevistyla* and *M. alpina* are very similar in flower structure they probably represent parallel developments from two distinct ancestral groups. *M. fusiformis,* like *M. lanceolata* (including its varieties), tends to become less pubescent from south to north in its range. Although this species is not known from southern Wyoming it may be expected probably on the west slope of the Medicine Bow Mountains as well as in southwestern Wyoming.

16. **Mertensia brevistyla** S. Wats. in U. S. Geol. Expl. 40th Par. [Bot. King's Exped.] **5**: 239, *pl. 23, f. 1–2.* 1871.

M. alpina var. *brevistyla* Jones, Contr. West. Bot. No. 12: 56. 1908.

Stems erect or ascending, 1–many from each fusiform rootstalk, more or less pubescent, 1–4 dm. tall; basal leaves (so far as known) broadly lanceolate to oblong, acute or otherwise, strigillose above, glabrous below, 5–13 cm. long, 2–4 cm. broad, petioles longer than the blade; cauline leaves obovate-oblong to narrowly elliptic, obtuse to acute, densely strigillose above, glabrous below, 2–6 cm. long, 0.5–3 cm. broad; inflorescence congested at first, becoming panicled in age; pedicels strigose, 1–14 mm. long; calyx 2–5 mm. long, divided almost to the base, strigose, the lobes narrowly triangular to linear, acute, 1.5–4 mm. long, 0.5–1 mm. broad at the base; corolla-tube 2–4 mm. long, slightly shorter to a little longer than the calyx-lobes, with or without a ring of scattered hairs toward the base within; corolla-limb rotate, 4–6 mm. long; anthers 1–1.3 mm. long, longer than the filaments, inserted on the tube and not exceeding the throat; fornices more or less prominent; style shorter than the calyx-lobes; nutlets rugose 2–3.5 mm. long.

Distribution: southern Wyoming, west-central Colorado, Utah in and adjacent to the Wasatch and Uinta Mountains, southeastern Idaho.

WYOMING: Bridge Peak, Sierra Madre Mountains, alt. 9000 ft., June 17, 1911, *Anthony 47* (US); Hayden Forest, alt. 8000 ft., July 24, 1912 *Eams* (ND); moist shrub-covered slopes, Hayden National Forest, June 5, 1930, *Nelson 11364* (UM, G, M, Ry, UCal, Pom).

COLORADO: Tennessee Pass, June 22, 1901, *Ferril* (C); Baxter Pass, alt. 8000 ft., May 27, 1908, *Jones* (Pom); Minturn, Eagle Co., June 5, 1902, *Osterhout 2561* (Ry); Sapinero, May, 1898, *Wheeler 448* (Ry, C).

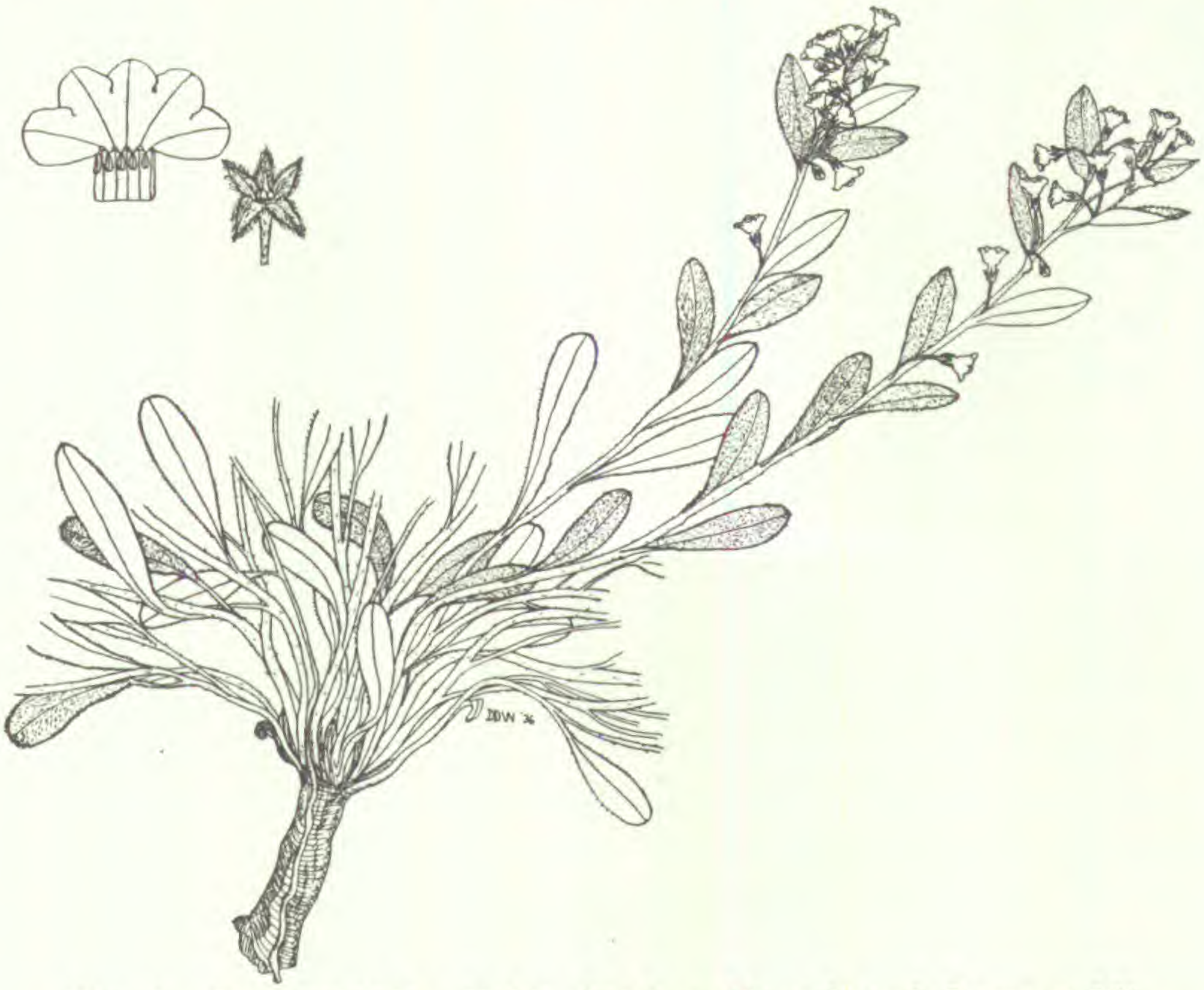

Fig. 9. *M. brevistyla.* Habit sketch × ⅓; enlarged flower × 1⅔.

IDAHO: usually deep black soil, high elevations, mountains east of Preston, coll. of 1909, *Henderson 17* (Ry); damp black soil high up on the mountain, east of Preston, May 13, 1909, *Henderson 18* (Ry).

UTAH: aspen woods, east slope of Mt. Timpanogos, Wasatch Mountains, Utah Co., June 12, 1933, *Applegate 8431* (G); Parley's Canyon, May 23, 1908, *Clemens* (M); Red Butte Canyon, May 25, 1908, *Clemens* (ANS); Parley's Canyon, May 29, 1908, *Clemens* (G); Ft. Douglas, May 3, 1909, *Clemens* (M); Red Butte Canyon, May 8, 1909, *Clemens* (G); Ft. Douglas, March 29, 1910, *Clemens* (CAS, Clokey); Salt Lake City, coll. of 1872, *Engelmann* (M); Salt Lake City, April, 1872, *Engelmann* (M); moist rich soil, Red Butte Canyon, April 22, 1905, *Garrett 1075* (Ry, ANS, G); Emigration Canyon, June 14, 1913, *Garrett 2716* (G); Gogorza, Salt Lake Co., May 27, 1922, *Garrett 2958* (Pom); Parley's Canyon, Salt Lake Co., June 16, 1923, *Garrett 3030* (G, Pom); locally common in open dry ground, near Bear River, Uinta Mountains, Summit Co., alt. 2500 m., June 7, 1931, *Goodman 1830* (G, M); uncommon among sagebrush, Horse Creek, Strawberry Reservoir, Uinta Basin, Wasatch Co., alt. 7700 ft., June 18, 1935, *Graham 9248* (M, W, Carnegie); hillside near road, 1 mile east of Soldier Summit, Wasatch, alt. 7000 ft., April 4, 1934, *Harrison 7323* (M); dry rocky slope, Rock Canyon, Provo, Utah Co., alt. 6000 ft., May 4, 1934, *Harrison 7550* (M); Salt Lake City, April 28, 1890, *Jones* (M, UCal); Ft. Douglas, April 28, 1890, *Jones* (Pom); Ft. Douglas, April 30, 1890, *Jones* (UCal, CAS, NY, ND, Ry, G); Parley's Canyon, alt. 8000 ft., July 1, 1898, *Jones* (Pom); Ft. Douglas, May 10, 1909, *Jones* (NY, CAS); Ft. Douglas, May 18, 1909, *Jones in part* (Pom, M, ND, G); Ft. Douglas, alt. 6000 ft., April 24, 1911, *Jones* (G, UCal, Pom); Ft. Douglas, alt. 6000 ft., May 7, 1881, *Jones 2148* (U, G, Ry, AM, Pom); Milburn, alt. 6500 ft., June 2, 1898, *Jones 6472* (M, Pom); under maple, entrance to Sardine Canyon, alt. 5000 ft., June 7, 1933, *Maguire 2438* (G, U); in deep rich soil, in sagebrush, northeast slopes, entrance Sardine Canyon, April 20, 1934, *Maguire 13105* (G); in dry sagebrush, hillside, summit of Sardine Canyon, Cache Co., alt. 5700 ft., May 26, 1933, *Muenscher & Maguire 2435* (U, G); among spruce trees, near West Fork of Bear River, Uinta Mountains, Summit Co., alt. 10,000 ft., July 7, 1926, *Payson & Payson 4918* (ANS, UCal, Ry, G, P, M, Pom); hillside, Cache Junction, Cache Co., May 2, 1909, *Smith 1544* (U, ND, Ry); hillsides, Cache Junction, Cache Co., May 1, 1911, *Smith 2341* (CAS); damp cliffs, Red Butte Canyon, near Salt Lake City, May 10, 1900, *Stokes* (UCal); Wasatch Mountains, alt. 5000 ft., May, 1869, *Watson* (G TYPE); among *Artemisia*, 4 miles north of Park City, Summit Co., May 25, 1935, *Williams & Williams 2143* (M, ND, P, W); hillside among scrub oak, canyon above Ft. Douglas, Salt Lake Co., May 26, 1935, *Williams & Williams 2146* (M, P, ND, W).

In the structure of the corolla *M. brevistyla* shows close relationship to *M. alpina* and *M. humilis.* However, its true relationship may be with *M. fusiformis* with which it shows a great similarity in structure of leaves and of roots as well as indument. Further evidence is found in the corolla of some terminal forms of *M. fusiformis* which approach *M. brevistyla* very closely. Greene's *M. congesta* is such a form of *M. fusiformis. Mertensia brevistyla,* as it is now understood, is thought to be possibly a parallel development to *M. alpina* and not necessarily contiguous with it, even though it simulates it very closely. The Colorado specimens cited are slightly at variance with the material from Utah, but are better referred here than to the allied species *M. fusiformis.* Professor Nelson's collection (No. 11364, which was, according to conversation with Professor Nelson, collected near the Sandstone Ranger Station in what is now Medicine Bow National Forest) taken not far to the north, is quite typical.

17. Mertensia humilis Rydb. in Bull. Torr. Bot. Club **36**: 681. 1909.

M. alpina var. *humilis* Macbr. in Contr. Gray Herb. N. S. No. 48: 20. 1916.

Stems ascending or erect, 4–20 cm. tall; basal leaves oblong-ovate to oblong-lanceolate, glabrous, subcoriaceous, 1–6 cm. long, 0.7–1.6 cm. broad, winged petiole longer or shorter than the blade; cauline leaves linear-oblong to lanceolate-oblong, glabrous or at most pustulate, sessile or nearly so, subcoriaceous, 1.5–6 cm. long, 0.5–1.5 cm. broad; inflorescence congested; pedicels glabrous or pustulate, 0–5 mm. long, calyx glabrous on the back, 2.5–5 mm. long, the lobes broadly to narrowly lanceolate, acute, ciliate, slightly accrescent in fruit, 2–4 mm. long, 0.75–1 mm. broad at the base; corolla-tube exceeding the calyx, glabrous within, 3–6 mm. long; corolla-limb subrotate, 3–6 mm. long; anthers longer than the filaments, 1–1.8 mm. long, included within the tube; fornices prominent, glabrous or slightly hairy, often nearly closing the throat (in

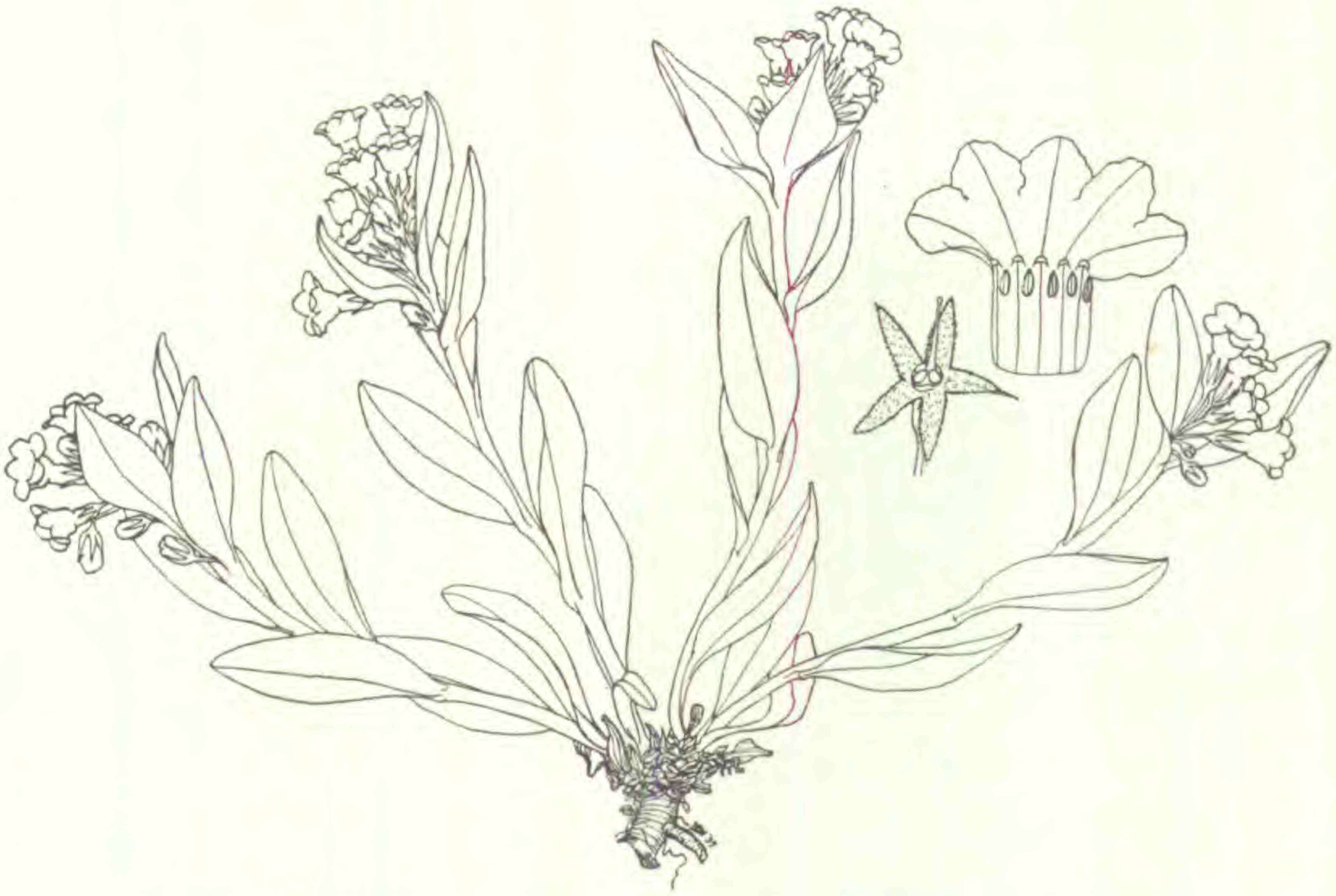

Fig. 10. *M. humilis.* Habit sketch × ⅔; enlarged flower × 1⅔.

fresh material); style 2–3.5 mm. long, about as long as the calyx; nutlets rugose, 2.5–3.5 mm. long.

Distribution: (possibly north-central to) southeastern Wyoming and adjacent Colorado on the high plains and hills.

WYOMING: Laramie, May 1, 1892, *Buffum 644* (Ry); Deer Creek, west of Ft. Laramie, April 10, 1860, *Hayden* (M); Deer Creek, above Ft. Laramie, April 15, 1860, *Hayden* (M); head of Muddy Creek, May 4, 1860, *Hayden* (M); sandy valley, rather dry, near Pilot Knob, *Hobbs 7* (ANS); mediumly moist, sandy soil, Centennial, May 26, 1913, *Hobbs 50 in part* (ANS); Buffalo, May, 1903, *Lothian* (Ry); loamy stream lands, Rock River, alt. 7000 ft., May 24, 1914, *Macbride 2252* (Ry); Laramie Hills, May 16, 1894, *Nelson 33* (Cl, ND, NY, Ry, G, M); Laramie Hills, May 18, 1895, *Nelson 1222* (Pom, Ry, NY); Laramie Hills, May 23, 1894, *Nelson 1234* (P); Laramie Hills, May 30, 1898, *Nelson 4326* (Ry); stony slopes, Sand Creek, Albany Co., June 2, 1900, *Nelson 7043* (Pom, NY TYPE, Ry, M, G); moist open slopes, Sherman, July 7, 1916, *Nelson 9735* (M); Laramie Hills, May 14, 1900, *Nelson 184* (NY); Laramie Plains, May 28, 1897, *Osterhout* (C, Ry); common on moist slopes, south end of Bates Hole, May 16, 1926, *Payson & Payson 4737* (M, Ry); granitic flats, Lake Creek, Medicine Bow Mountains, Albany Co., June 7, 1934, *Williams 1730* (M); barren sandstone knoll one mile east of Laramie, Albany Co., alt. 7200 ft., May 19, 1935, *Williams 2113* (M, W); rocky sandstone hill, 1 mile east of Laramie, Albany Co., alt. 7200 ft., May 21, 1935, *Williams 2120* (M, W); barren limestone hill, 1 mile east of Laramie, Albany Co., alt. 7000 ft., June 13, 1935, *Williams 2193* (W, M); granitic summits on Sherman Hill, Laramie Mountains, alt. 8500 ft., May 25, 1931, *Williams & Solheim 162* (W).

COLORADO: infrequent among sage, Cowdrey, North Park, June 19, 1920, *Ramaley 11773* (C).

Mertensia humilis seems to be most closely allied to *M. alpina.* Field study of both species shows them to be amply distinct. With the exception of a specimen from "Buffalo" Wyoming, which may bear a false label, this species seems to be limited to southeastern Wyoming and adjacent Colorado on the high plains and hills. This distribution is not distinctive for this plant since other species show the same restricted range, *Phlox glabrata* (E. Nels.) Brand., for instance. Although *M. humilis* seems to be restricted in range, within that area it is extremely common. The truncated summit of the Laramie Mountains between Cheyenne and Laramie is literally blue with the plant when it is in flower.

18. **Mertensia alpina** (Torr.) G. Don, Gen. Hist. **4**: 372. 1838.
M. Tweedyi Rydb. in Mem. N. Y. Bot. Gard. **1**: 336. 1900.
M. obtusiloba Rydb. in Bull. Torr. Bot. Club **28**: 32. 1901.

M. brevistyla obtusiloba A. Nels. in Coult. & Nels., Man. Ry. Mt. Bot. 421. 1909.
Pulmonaria alpina Torr. in Ann. Lyc. N. Y. **2**: 224. 1828.
Cerinthodes alpinum O. Kuntze, Rev. Gen. Pl. pt. 2: 436. 1891.

Stems glabrous, erect or ascending, 1–many from each rootstalk, 2–30 cm. tall; basal leaves oblong to linear-lanceolate, short-strigillose above, glabrous below, blade 1–7 cm. long, 0.5–3 cm. broad, winged petiole usually shorter than the blade; cauline leaves sessile or nearly so, broadly to narrowly lanceolate or elliptical, 1–6 cm. long, 0.3–1.8 cm. broad, short-strigillose above, glabrous below; inflorescence sometimes slightly panicled in age; pedicels strigose or glabrous, 1–10 mm. long; calyx divided almost to the base, 2–5 mm. long, often slightly accrescent, lobes linear-lanceolate to oblong, obtuse or acute, glabrous on the back, ciliate; corolla-tube glabrous within, as long as or usually exceeding the calyx-lobes, 3–6 mm. long; corolla-limb much expanded, 2–6 mm. long; anthers about 1 mm. long, about as long as or longer than the filaments, inserted in the tube and not projecting beyond it; fornices prominent, often almost closing the throat; style short, about equalling the calyx; nutlets about 2 mm. long, rugose.

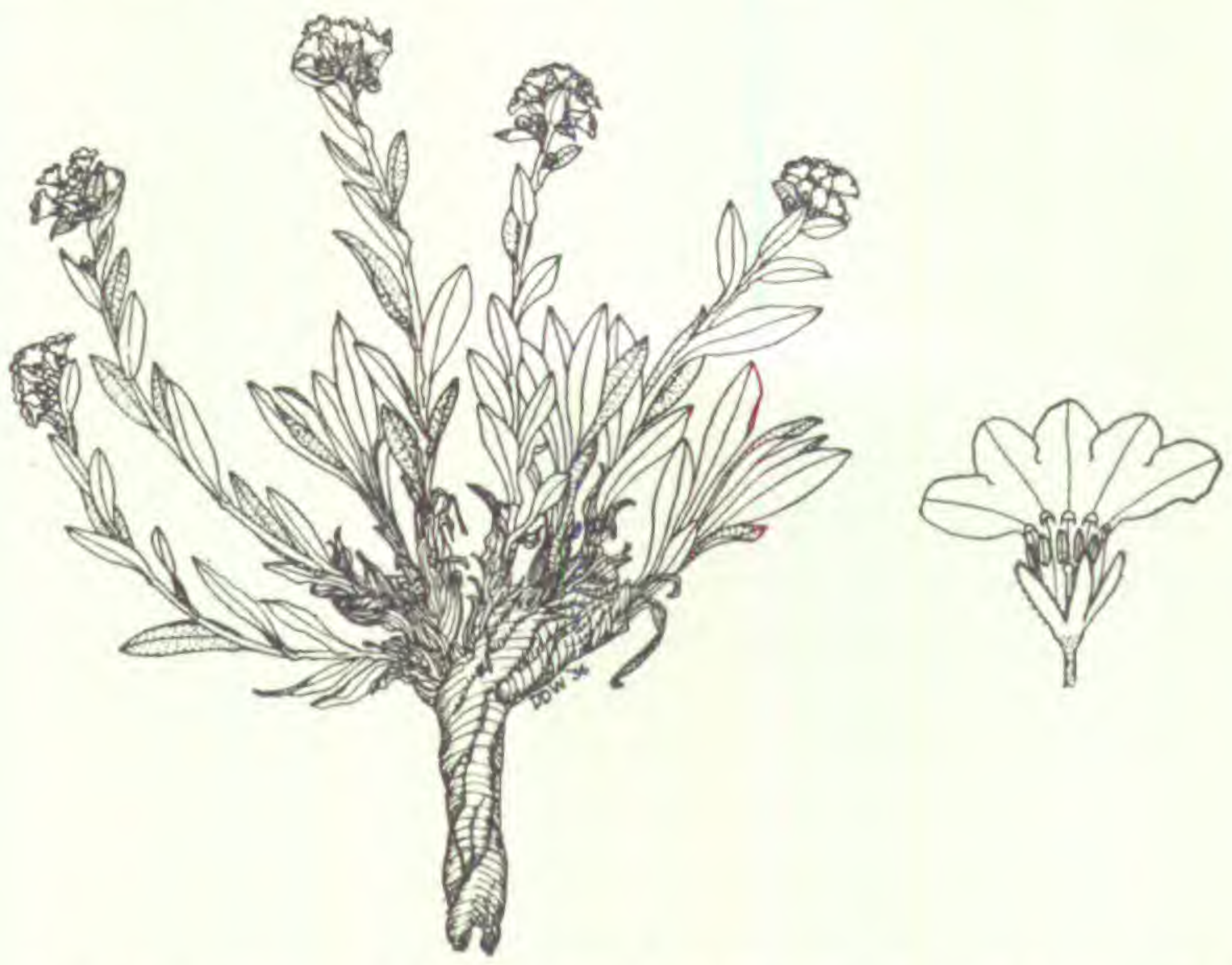

Fig. 11. *M. alpina.* Habit sketch × ⅓; enlarged flower × 1⅔.

Distribution: southwestern Montana, adjacent Wyoming and Idaho, south to northern New Mexico. Alpine or subalpine in the high mountains.

MONTANA: Middle Creek Canyon, Mt. Hyalite, alt. 10,000 ft., Aug. 1, 1902, *Blankinship* (FC); Grasshopper Glacier, near Cook City, alt. 10,500 ft., Aug. 6, 1926, *Conard 1896* (Ry); Lake Plateau, alt. 9000 ft., Aug., 1899, *Koch* (NY); Lake Plateau, alt. 10,000 ft., Aug. 1, 1897, *Koch 34* (G); mountains near Indian Creek, alt. 8000 ft., July 21, 1897, *Rydberg & Bessey 4866* (NY, ND, F); Old Hollowtop, near Pony, alt. 9000 ft., July 7 and 9, 1897, *Rydberg & Bessey 4867* (G, NY TYPE *M. Tweedyi*, P, UM, ND, F, Ry); moist mountain side, Gallatin Peak, Gallatin Co., Aug. 23, 1928, *Swingle* (Ry, FC); Spanish Peaks, July 10, 1901, *Vogel* (G).

WYOMING: without definite locality, July 18, 1891, *Buffum 643* (Ry); summit, Mt. Washburn, Aug. 6, 1924, *Conard 1573* (Ry); Mt. Washburn, alt. 10,300 ft., July 10, 1931, *Condon 5753* (M); upper Buffalo Fork to head of Du Noir River, Aug. 15–Sept. 8, 1899, *Curtis* (NY); receding snow, Ten Sleep Lakes, Big Horn Co., July 31, 1901, *Goodding 447* (Ry); summit of mountain, Big Horn Mountains, alt. 10,000 ft., July 27, 1900, *Jack* (G); alpine meadow, near top of Mt. Washburn, alt. 10,600 ft., July 14, 1932, *Maguire & Maguire 1211* (U, UCal, Pom); Dome Lake, Big Horn Mountains, July 18, 1896, *Nelson 2430* (Ry) and *2434* (G, Cl, M, Ry); among the rocks of the cliffs, Laramie Peak, Albany Co., July 12, 1900, *Nelson 7549 in part* (C); on moist, craggy summit, The Thunderer, July 13, 1899, *Nelson & Nelson 5811* (G, M, Pom, AM, Cl, NY, O, ND, Ry); Dome Lake, Elk Mountain, Sheridan Co., alt. 10,500 ft., June 28, 1897, *Pammel & Stanton* (NY, M); alpine rock-gravel slopes, Saltlick Mountain, northeast of Kendall, Sublette Co., Aug. 7, 1922, *Payson & Payson 2977* (Pom, G, UCal, F, M, NY, ANS, Ry); in the vicinity of Green River lakes, Sheep Mountain, Sublette Co., alt. 10,700–11,600 ft., Aug. 1, 1925, *Payson & Payson 4467* (Ry, M, G); dry to moist gravel slopes, Mt. Washburn, alt. 10,200 ft., July 25, 1928, *Smith 28* (P); Black Rock Creek, Teton Forest Reserve, alt. 11,000 ft., Aug. 1897, *Tweedy 166* (NY); Mt. Holmes, Yellowstone Park, alt. 9400 ft., Aug., 1884, *Tweedy 192* (NY, ND); Big Horn Mountains, Sheridan Co., alt. 11,000 ft., Aug., 1899, *Tweedy 2602* (NY); dry gravelly soil, Mt. Washburn, Yellowstone Park, alt. 10,000 ft., July 11, 1921, *Wiegand 2082* (Cl).

COLORADO: Pike's Peak, Aug. 6, 1916, *Bates 6410 in part* (Cl); Pike's Peak, July 21, 1894, *Bessey* (NY); Garden of the Gods, Pike's Peak, July 24, 1894, *Bessey* (NY); Pike's Peak, alt. 13,000 ft., July 27, 1895, *Bessey* (NY); Pike's Peak, alt. 12,500 ft., Aug. 6, 1895, *Bessey* (NY); Pike's Peak, alt. 13,000 ft., July 25, 1896, *Bessey* (NY); Pike's Peak, alt. 13,000 ft., June 25, 1896, *Biltmore Herbarium 2700a* (G); alpine, Pike's Peak, Aug. 27, 1895, *Canby* (G); Pike's Peak, coll. of 1900, *Clements* (NY TYPE *M. obtusiloba);* Saddle Cliffs, alt. 4000 m., July 6, 1901, *Clements & Clements 405* (G, M, Ry, Cl, NY); moist hillsides, Pike's Peak, alt. 13,000 ft., Sept. 3, 1919, *Clokey 3309* (Clokey); moist soil along stream, Pike's Peak, El Paso Co., alt. 3965 m., Aug. 30, 1920, *Clokey 3849* (Clokey, CAS, G, NY, UM, F, P); among rocks above Wood's reservoir, Cripple Creek, Teller Co., alt. 3570 m., July 31, 1920, *Clokey 3856* (Clokey, CAS, P); above timberline, Pike's Peak, Aug. 11, 1884, *Crocker* (ANS); Pike's Peak, alt. 14,000 ft., Aug. 19, 1915, *Drushel* (M); coll. of 1862, *Hall & Harbour 443* (Cl, F); The Saddle, Pike's Peak Trail, Aug., 1900, *Harper & Harper* (M); Pike's Peak, Aug. 13, 1888, *Holway 30* (NY); Pike's Peak, Aug. 2, 1904, *Huestis* (Clokey, C); Rocky Mountains, *James* (NY TYPE); on Long's Peak, July, 1905, *Johnston 18* (Ry); very common on cool north-facing alpine slope, The Saddle, Pike's Peak Region, July 9, 1920, *Johnston 2811* (UCal); very common on a grassy slope just below timberline, between Seven Lakes and Lake Moraine, Pike's Peak, alt. 11,200 ft., July 14, 1920, *Johnston 2812* (G); at timberline, on grassy subalpine slope, Windy Point, Pike's Peak, alt. 11,600 ft., Aug. 3, 1920, *Johnston 2813* (G); Argentine Pass, alt. 12,000 ft., July 10, 1878, *Jones 54 in part* (NY); Pike's Peak, Aug., 1885, *Leconte* (ANS); Pike's Peak, alt. 13,000 ft., Aug. 13, 1884, *Letterman 339* (M); Pike's Peak, El Paso Co., alt. 14,000 ft., Aug. 26, 1915, *Munz 118* (Cl); Pike's Peak, Aug. 26, 1915, *Osterhout 5389* (O, Ry); Pike's Peak, alt. 9000 ft., June, 1891, *Penard 474* (NY); Arapahoe Mountain, alt. 11,000 ft., July, 1891, *Penard 529* (NY); Pike's Peak, alt. 13,000 ft., July 8, 1893, *Saunders* (NY); near summit, Pike's Peak, Aug., *Schedin & Schedin 314, 323* (Ry); Pike's Peak, alt. 14,000 ft., Aug. 16, 1892, *Sheldon 5823* (NY); Pike's Peak, alt. 13,000 ft., Aug., 1914, *Walker* (C); Pike's Peak, July, 1888, *Wentworth* (NY); near a stream above Glen Cove, north side of Pike's Peak, El Paso Co., alt. 12,000 ft., Aug. 10, 1935, *Williams 2464* (W, M); Colorado Springs, Park Co., alt. 13,000 ft., July, *Williamson* (ANS); above timber-line, Pike's Peak, July 10, 1901, *Williamson* (ANS); Pike's Peak, June, 1894, *Woodruff* (NY).

NEW MEXICO: mountain, head of Red River, Franklin, July 26, 1897, *Berg 1632* (FC, NY).

IDAHO: base to summit of mountains northeast of lake, north side of peak, Henry Lake, Fremont Co., alt. 9000 ft., July 17, 1920, *Payson & Payson 2043* (G, Clokey, CAS, NY, Ry, M); Mt. Chauvet, alt. 10,000 ft., July 29, 1897, *Rydberg & Bessey 4865* (NY, US).

Mertensia alpina has been a convenient name for any *Mertensia* of high altitudes in the West and has been applied to most of them. In the main it is easily distinguished by the included anthers. Superficially, *M. alpina* is closely allied to *M. brevistyla* and *M. humilis,* but it may be, and probably is, more closely related to *M. viridis,* which it approaches in habit, leaves, pubescence, and is approached by *M. viridis* in the structure of the corolla in some unusual specimens. The greater part of the material examined is from Colorado, and all but a few specimens are from Pike's Peak. More localities are known for Wyoming, although that state is much less perfectly known botanically than Colorado. The discontinuous distribution of *M. alpina* is of interest. Several other of the plants limited to the high mountains of the Rocky Mountain area show a similar distribution, and more will no doubt be found when the flora is better understood.

19. Mertensia viridis A. Nels. in Bull. Torr. Bot. Club **26**: 244. 1899.

M. lanceolata var. *viridis* A. Nels., First Rept. Fl. Wyo., 158. 1896.

M. ovata Rydb. in Bull. Torr. Bot. Club **28**: 32. 1901.

M. leneariloba Rydb., *l.c.*

M. Parryi Rydb. in Bull. Torr. Bot. Club **31**: 639. 1904.

M. perplexa Rydb., *l.c.*

M. viridula Rydb., *l.c.*

M. papillosa leneariloba A. Nels. in Coult. & Nels., Man. Ry. Mt. Bot. 421. 1909.

M. lanceolata var. *leneariloba* Macbr. in Contr. Gray Herb. N. S. No. 48: 15. 1916.

M. alpina var. *perplexa* Macbr., *l. c.* 20.

Stems erect or ascending, 5–35 cm. tall, 1–several from each rootstalk; basal leaves lanceolate to ovate, 2–10 cm. long, 1–4 cm. broad, strigillose above, glabrous below, lateral veins sometimes apparent, petioles longer or shorter than the blade; cauline leaves sessile or nearly so, lanceolate to broadly ovate, 2–7 cm. long, 0.7–2.5 cm. broad, strigillose above, glabrous below, lateral veins rarely visible; inflorescence a crowded, modified, scorpioid cyme; pedicels strigose or glabrous, 1–10 mm. long; calyx 2–6 mm. long (mostly 4–5 mm.), the lobes divided almost to the base, linear-lanceolate to narrowly ovate-lanceolate, acute or obtuse, glabrous on the backs, ciliate, somewhat accrescent in fruit; corolla-tube 3–9 mm. long (mostly about 6 mm.), usually with a ring of crisped hairs near the base within, occasionally also with scattered hairs; corolla-limb 4–9 mm. long (mostly about 5 mm.), moderately expanded, usually a little shorter than the tube in flowers having a long style and filaments longer than the anthers, in flowers having a short style and filaments about the same length as or shorter than the anthers the tube may be much shorter than the limb; anthers 1–2.5 mm. long (usually about 1.5–2 mm.); filaments 1–3.5 mm. long, longer or shorter than the anthers; fornices conspicuous, glabrous to densely pubescent; style various, exceeding the anthers and about as long as the corolla to shorter than the tube of the corolla; nutlets 2–3 mm. long, rugose.

Distribution: Montana (Deer Lodge Co.), south through Colorado and Utah, in the mountains.

MONTANA: alpine meadows, Mt. Baldy, Anaconda, alt. 9300 ft., July 21, 1909, *Blankinship* (UCal, Ry); Mt. Powell, Deer Lodge Co., alt. 10,000 ft., June 30, 1918, *Blankinship* (Pom, UCal, Ry).

WYOMING: Laramie Peak, Aug. 6–7, 1895, *Nelson 1608* (G, Ry TYPE); among the rocks of the cliffs, Laramie Peak, Albany Co., July 12, 1900, *Nelson 7549* (Pom, O, G, Ry, M); alpine rock crevices, Wind River Mountains, 10 miles northeast of Fremont Lake, Sublette Co., July 30, 1922, *Payson & Payson 2886* (UCal, F, G, Pom); rocks near summit, Saltlick Mountain, northeast of Kendall, Sublette Co., Aug. 7, 1922, *Payson & Payson 2979* (US, M).

COLORADO: Continental Divide, Estes Park, alt. 10,000 ft., Aug. 7, 1933, *Allen 105* (M); timberline, Arapahoe Pass, coll. of 1904, *Andrews 9* (Ry); trail, Pike's Peak, July, 1895, *Atkinson* (Cl); Cameron Pass, alt. 11,500 ft., July 14, 1896, *Baker* (M, NY, ND, Pom); north Cheyenne Canyon, from the neighborhood of Pike's Peak, July 16, 1894, *Bessey* (NY TYPE *M. viridula)*; Cascade Cañon, alt. 8000 ft., July 11, 1895, *Bessey* (NY); Breckenridge, coll. of 1871, *Brandegee* (ANS); Breckenridge, Summit Co., coll. of 1871, *Brandegee 256* (UCal); alpine, Sierra Sangre de Cristo, Aug., 1873, *Brandegee 652* (UCal, M); Chasm Lake, Long's Peak, Aug. 14, 1907, *Clements* (NY); Jack Brook, June 25, 1901, *Clements & Clements 232* (Ry, US, NY, G, Cl, M); mountain side, Ida Bell Mine, Summit Co., alt. 11,500 ft., Aug. 8, 1917, *Clokey 2902* (Ariz, CAS, Ry, NY, G, Clokey, F); mountain side, Arapahoe Peak, Boulder Co., alt. 12,000 ft., July 29, 1918, *Clokey 3187* (Clokey, CAS, G, Ry, NY, M); open hillsides, Caribou Mine, Boulder Co., alt. 10,200 ft., June 12, 1919, *Clokey 3293, 3294* (Clokey); among rocks, above timber, Manassas Creek, Chaffee Co., alt. 10,000 ft., July 27, 1919, *Clokey 3560* (Clokey, CAS, P, NY, UM, G, Ry, M, Pom); cold soil below cliff, near snow, Lach Vale, Estes Park, Larimer Co., alt. 3126 m., Sept. 16, 1920, *Clokey 3850* (Clokey, UM, CAS, NY, P); moist soil, Mt. McClellan, Clear Creek Co., alt. 3935 m., Aug. 14, 1920, *Clokey 3851* (F, CAS, UCal, Clokey, ANS, Ry, UM, G, M, NY, Pom); dry hillside, Waldorf Mine, Clear Creek Co., alt. 11,900 ft., Aug. 15, 1920, *Clokey 3854* (Clokey); dry hillside, Fall River Pass, Grand Co., alt. 3485 m., Aug. 11, 1921, *Clokey, Bruderlin & Clokey 4256* (F, CAS, Clokey, ANS, M, Ry, C, UM, NY, Pom); Long's Peak, alt. 11,000–11,500 ft., Aug. 3–5, 1904, *Cooper 74, 169* (Ry); Estes Park, alt. 12,000 ft., Aug. 13, 1906, *Cooper 119* (Ry); among large boulders on north-facing slope, James Peak, alt. 11,500 ft., July 14, 1929, *Cox 371* (F); Front Range, alt. 12,000 ft., July 6, 1896, *Crandall* (M); trail, Gray's Peak, alt. 12,000 ft., July 18, 1892, *Crandall 739, 1819* (FC); Rocky Mountain National Park, July, 1926, *DeFrance* (Cl); Mt. Audubon, July 19, 1908, *Dodds & Robbins 5819* (Ry); moist soil near water, Cascade, July 1, 1903, *Ferril* (Clokey, C); Graymont, July 16, 1891, *Fritchey* (M); rocky north slopes, Anita Peak, Routt Co., Aug. 3, 1903, *Goodding 1777* (UCal, G, C, Cl, NY, M, Ry); moist places below snow, summit of North Park Range, Larimer Co., Aug. 10, 1903, *Goodding 1827 in part* (Ry, ANS, Cl, G, UCal); among boulders on summit, Ethel Peak, Larimer Co., Aug. 14, 1903, *Goodding 1889* (NY, Ry); on north slope of burned-over area, 2 miles southeast of mouth of Wolf Creek, south side of White River, Uinta Basin, Rio Blanco Co., alt. 6500 ft., June 1, 1935, *Graham 9070 in part* (W, M, Carnegie); Colorado mountains, coll. of 1872, *Gray* (G); Corona Crest, alt. 11,700 ft., June 30, 1914, *Hall* (UCal); St. Elmo, June, 1886, *Harper* (F); Beaver Creek, alt. 12,000 ft., July 19, 1898, *Herb. Colo. State Agric. Coll. 4189* (NY, FC, P, Ry); James' Peak, alt. 13,000 ft., July 26, 1899, *Holm* (F); Torrey's Peak, coll. of 1877, *Hooker & Gray* (M, G); Gray's and Torrey's Peaks, coll. of 1877, *Hooker & Gray* (G); Sierra Blanca, coll. of 1877, *Hooker & Gray* (G); Rollins Pass, July 20, 1895, *Huestis* (C); Rollins Pass, July 18, 1903, *Huestis* (C); up Bear Creek, Colorado Springs, June 12, 1917, *Johnston & Hedgcock 536* (G); Colorado Springs, alt. 6000 ft., May 3, 1878, *Jones 916* (NY); on roof of Lake Isabel cabin, Boulder Co., alt. 10,800 ft., June 29, 1934, *Kiener 1045* (W); subalpine meadow below Lacy Lake, Boulder Co., alt. 10,400 ft., July 7, 1934, *Kiener 1046* (W); Gray's Peak, July 22, 1886, *Letterman* (M); Pike's Peak, alt. 13,000 ft., Aug. 13, 1884, *Letterman 339* (F); near Breckenridge, Summit Co., alt. 12,500 ft., Aug., 1901, *Mackenzie 220* (Ry, M); Pingree Park, Aug. 2, 1924, *McCarty 36* (UCal); Glen Eyrie to Garden of the Gods, June, 1895, *Meredith* (ANS); Long's Peak, Aug. 1896, *Mosely* (C); Boulder Co., coll. of 1896, *Mosely A316* (C, Ry); mountain meadow, Corona, Aug. 6, 1919, *Munz 2967* (Pom); moist alpine at James Peak, alt. 13,000 ft., Aug. 7, 1919, *Munz 3046* (Pom); mountains of Estes Park, July 22, 1897, *Osterhout* (F); mountains south of Ward, Boulder Co., July 18, 1901, *Osterhout 2439* (UCal, O, NY TYPE *M. perplexa);* mountains of Estes Park, Larimer Co., July 22, 1903, *Osterhout 2848* (NY, Ry, UCal); range beyond Windy Gulch, mountains of Estes Park, Larimer Co., Aug. 19, 1905, *Osterhout 3116b* (O); Gray's Peak, Clear Creek Co., July 20, 1910, *Osterhout 4353* (O); range beyond Windy Gulch, Moraine Park, Larimer Co., Aug. 4, 1922, *Osterhout 6281* (O); Rocky Mountains, coll. of 1862, *Parry* (US); Rocky Mountains, coll. of 1872, *Parry* (NY, G, ANS, M); from the headwaters of Clear Creek, and the alpine ridges lying east of "Middle Park," coll. of 1861, *Parry 286* (G, NY TYPE *M. Parryi);* from the headwaters of Clear Creek, and the alpine ridges lying east of "Middle Park," Rocky Mountains, coll. of 1861, *Parry 287* (F); high mountains, Gray's Peak and vicinity, alt. 11,000–14,000 ft., July, Aug. 28, 1885, *Patterson 113* (F, M, UCal); Gray's Peak, Aug., 1882, *Patterson & Beaty* (F); Silver Lake, Aug., 1914, *Phelps* (CAS); vicinity of Colorado Springs, *Pierce* (NY); Long's Peak, July 24, 1920, *Preston* (FC); Rollins Pass, Corona, Aug. 7–8, 1907, *Ramaley 3325, 3326* (AM); shade, Tolland, July 1, 1916, *Ramaley 10649* (C); Bryan Mountain, alt. 11,000 ft., July 12, 1916, *Ramaley 10690* (Ry, C); Upper Stuart Lake, near Tolland, July 31, 1918, *Ramaley 11446* (C); damp knoll, Tolland, alt. 2800 m., July 14, 1920, *Ramaley & Clokey 3855* (US, P, CAS, Clokey); damp knoll, Tolland, Gilpin Co., alt. 2800 m., July 14, 1920, *Ramaley & Clokey 3976* (P, Clokey, CAS); at timberline and above on Bald Mountain, Boulder Co., alt. 11,500 ft., July 20, 1907, *Ramaley, Dodds & Robbins 3247* (Ry, C); above timber, Arapahoe Mountain, July 29, 1906, *Ramaley & Robbins 2411* (Ry, C); Rollins Pass, Corona, alt. 11,000–11,700 ft., Aug. 7–8, 1907, *Ramaley & Robbins 3325, 3326* (Ry, C); Tolland, July 4, 1908, *Ramaley & Robbins 5217* (C); Gray's Peak, alt. 12,000 ft., July 30, 1872, *Redfield* (M); Mt. Audubon, July 19, 1908, *Robbins 5819* (C); West Spanish Peak, alt. 2800–3000 m., July 6, 1900, *Rydberg & Vreeland 5690* (FC, O, Ry, NY TYPE *M. ovata);* West Spanish Peak, alt. 3000–3800 m., July 9, 1900, *Rydberg & Vreeland 5690a* (NY); West Indian Creek, alt. 2500–2700 m., June 14–15, 1900, *Rydberg & Vreeland 5691* (NY TYPE *M. lineariloba);* wet woods between Brainard and Mitchell Lakes west of Ward, July 17, 1919, *Schmoll 4* (C); near Lake Isabelle, Ward, June 24, 1922, *Schmoll 558, 559* (C); Alpine Tunnel, alt. 11,000 ft., July

17, 1897, *Shear 3853* (NY); above timber, Gray's Peak, Aug. 31, 1884, *Smith* (ANS); Rocky Mountains, coll. of 1868, *Vasey 437* (G, M); Sapinero, May 29, 1898, *Wheeler 454* (Ry, C); Pike's Peak auto road, El Paso Co., alt. 8500 ft., June 9, 1922, *Wiegand & Upton 4133* (Cl); moist hillsides in aspen, toward the base of Pike's Peak, 17 miles east of Colorado Springs, El Paso Co., alt. 8000 ft., June 22, 1935, *Williams 2251* (M, ND, W); moist mountain side, Trail Ridge, Rocky Mountan National Park, alt. 11,000 ft., July 19, 1935, *Williams 2411* (M, ND, W); rocky, grassy summit of a mountain east of Cameron Pass, Jackson Co., alt. 12,000 ft., July 21, 1935, *Williams 2446* (M, W); moist grassy slope of a mountain east of Cameron Pass, alt. 11,500 ft., July 21, 1935, *Williams 2448* (M, W); rocky, grassy summit of a mountain west of Cameron Pass, Jackson Co., alt. 12,000 ft., July 21, 1935, *Williams 2450* (M, W); slopes of Mt. Chapin, Larimer Co., Aug. 14, 1927, *Woodson 1848* (M); July 29, 1903, *Young* (F).

UTAH: gravel, Mt. Ellen, Henry Mountains, alt. 10,000 ft., July 27, 1894, *Jones 5688* (Pom, M); among rocks, alpine belt, west slope of Mt. Peale, La Sal Mountains, San Juan Co., alt. 12,000 ft., July 5, 1932, *Maguire & Redd 2117* (U); saddle, south of Mellenthin, La Sal Mountains, San Juan Co., alt. 11,800 ft., July 26, 1933, *Maguire, Richards, Maguire & Hammond 5109* (U, G); in cirque on east side of Mt. Mellenthin above timberline, La Sal Mountains, San Juan Co., alt. 11,800 ft., July 26, 1933, *Maguire, Richards, Maguire & Hammond 5110* (G); west slope of Mt. Hobbs, 2000 ft. above timberline, La Sal Mountains, Grand Co., alt. 11,800 ft., July 18, 1933, *Maguire, Richards, Maguire & Hammond 5111* (UCal, U, O); meadows in saddle between Castle and Waas Mountains, La Sal Mountains, Grand Co., alt. 11,500 ft., July 13, 1933, *Maguire, Richards, Maguire & Hammond 5112* (M, U, G); rocky slope on north side of Gold Mountain, La Sal Mountains, Grand Co., July 11, 1933, *Maguire, Richards, Maguire & Hammond 5113* (M, UCal, U, G); summit of Mt. Tuk, La Sal Mountains, San Juan Co., July 29, 1933, *Maguire, Richards, Maguire & Hammond 5114* (G); rock slides, La Sal Mountains, Grand Co., alt. 11,000–11,500 ft., July 23, 1924, *Payson & Payson 3983* (UCal, G, M, Ry); slide rock, La Sal Mountains, Grand Co., alt. 11,500 ft., July 27, 1924, *Payson & Payson 4032* (G, Ry); rocky soil, Mt. Tomasaki, La Sal Mountains, alt. 11,000–12,000 ft., Aug., 1897, *Purpus 6675* (M, UCal); La Sal Mountains, alt. 3300–3600 m., July 7, 1911, *Rydberg & Garrett 8653* (Ry, NY); Horse Gulch and vicinity, La Sal Mountains, alt. 3000–3200 m., July 15, 1911, *Rydberg & Garrett 8957* (NY, O), *8958* (Ry, NY), and *8959* (NY); La Sal Mountains, near Mt. Peal, alt. 3300–3700 m., July 17, 1911, *Rydberg & Garrett 8998* (NY); dry hillsides, vicinity of Flaming Gorge, Daggett Co., alt. 6000 ft., June 2, 1932, *Williams 488* (W, U, Ry, M, CAS, Pom).

WITHOUT LOCALITY: a specimen marked "ex herb. Hooker, *Lithospermum Drummondii,* Fl. Bor.-Am." and "Nov. 1874. I say it is *M. sibirica* Don var. *Drummondii.* Large flowered form." A. Gr. [ay]. The specimen probably came from Colorado. (NY). See footnote on p. 140.

19a. Mertensia viridis var. **dilatata** (A. Nels.), comb. nov.

M. coriacea A. Nels. in Bull. Torr. Bot. Club **29**: 402. 1902.

M. coriacea var. *dilatata* A. Nels., *l.c.* 403.

Similar to the species except the leaves glabrous on both sides.

Distribution: in the mountains of southeastern Wyoming, adjacent Colorado, and Uinta Mountains, Utah.

WYOMING: Medicine Bow Mountains, Aug., 1856, *Engelmann* (M); Medicine Bow Peak, Medicine Bow Mountains, Albany Co., alt. 11,500 ft., Aug. 3, 1929, *Greenman & Greenman 6196* (M); alpine rocky heights, Medicine Bow Mountains, July 17, 1925, *Hanna 100* (M); shores of alpestrine lakes, Medicine Bow Mountains, Albany Co., Aug. 1, 1900, *Nelson 7844* (Pom, C, M, G, Ry TYPE); in alpine rock slides, Medicine Bow Mountains, Albany Co., Aug. 1, 1900, *Nelson 7870* (Pom, C, G, Ry TYPE *M. coriacea,* M); in alpine rock slides, Medicine Bow Mountains, Aug. 15, 1908, *Nelson 9149* (G, M, Ry, Cl); alpine, among rocks, Medicine Bow Mountains, Aug. 14, 1914, *Nelson 9683* (M) and *9686* (Ry); wet stony ridges, University Camp, Medicine Bow Mountains, June 29, 1925, *Nelson 10554* (Ry, UM); alpine, among quartzite rock, Medicine Bow Mountains, July 15, 1925, *Nelson 10574* (G, M, Ry, UCal); La Plata Mines, Aug. 29, 1898, *Nelson 5182* (Ry); among large rocks on Medicine Bow Peak, Medicine Bow Mountains, alt. 11,500 ft., Aug. 4, 1926, *Payson & Payson 5156* (UCal, ANS, M, P, Ry, G, Pom); dry plains and rocky hills, Mt. Steele, Carbon Co., alt. 6500 ft., May 25–June 10, 1901, *Tweedy 4268* (NY); moist rocky hillside, upper Libbey Creek, Medicine Bow Mountains, Albany Co., July 13, 1935, *Williams 2386* (M, ND, O, P, NY, G, W).

COLORADO: moist places below snow, summit of North Park Range, Larimer Co., Aug. 10, 1903, *Goodding 1827* (C, M).

UTAH: grassy slopes, Uinta Mountains, Daggett Co., alt. 10,000 ft., June 11, 1932, *Williams 599* (W, U, Ry, CAS).

19b. Mertensia viridis var. **caelestina** (Nels. & Ckll.), comb. nov.

M. caelestina Nels. & Ckll. in Proc. Biol. Soc. Wash. **16**: 46. 1903.

Cauline leaves lanceolate to ovate, glabrous on both surfaces; calyx 6–7 mm. long, the lobes linear-lanceolate to oblong, acute or obtuse, ciliate; corolla-tube 7–9 mm. long, glabrous or pubescent within; corolla-limb 5.5–8 mm. long.

Distribution: northern New Mexico.

NEW MEXICO: Lake Peak, vicinity of Santa Fe, Aug. 12, 1926, *Arsène & Benedict 16131* (F); mountain tops, head of Red River, Franklin, July 26, 1897, *Berg* (NY, FC); near timberline, Santa Barbara Divide, July 25, 1931, *Castetter 726* (NMex, Ry); above timberline, Truchas Peak, coll. of 1902, *Cockerell 40* (Ry TYPE); top of Pecos Baldy, alt. 12,500 ft., July 11, 1908, *Standley 4269* (AM); Truchas Peak, alt. 12,500 ft., Aug. 8, 1908, *Standley 4784* (M, NY, AM); above timberline, Baldy Peak, Colfax Co., alt. 3600 m., Sept. 4, 1916, *Standley 14329* (US).

19c. Mertensia viridis var. **cynoglossoides** (Greene) Macbr. in Contr. Gray Herb. N. S. No. 48: 13. 1916.

M. cynoglossoides Greene, Pl. Baker. **3**: 19. 1901.

M. muriculata Greene, *l.c.*

Stems 3–5.5 dm. tall; basal leaves elliptic-oblong to ovate, 11–15 cm. long, 4–6 cm. broad, scabrous above, the bases of the hairs pustulate; cauline leaves oblong to ovate, 4–13 cm. long, 3–5 cm. broad, pubescence as of basal leaves; pubescence of pedicels spreading, hispid.

Distribution: known only from the type locality.

COLORADO: Black Canyon, June, 1901, *Baker* (Pom); Black Canyon, June 20, 1901, *Baker 191* (Pom, ND TYPE, UCal, Ry, P, M, G); Black Canyon, June 20, 1901, *Baker 193* (M, ND TYPE *M. muriculata*, Ry, G, US, Pom).

19d. Mertensia viridis var. **parvifolia,** var. nov.[1]

Stems ascending; basal leaves lanceolate 1.5–3 cm. long, 0.5–1 cm. broad, glabrous below, strigose above, petiole longer than the blade; cauline leaves linear-lanceolate to lanceolate, 1–5 cm. long, 0.2–1 cm. broad, glabrous below, strigose above, usually directed upward and hence appearing unilateral on the stems.

Distribution: north-central Colorado.

COLORADO: open hillside, Caribou Mine, Boulder Co., alt. 10,200 ft., June 12, 1919, *Clokey 3293* (UM, G, M, P, CAS, Pom, NY, Ry); open hillside, Caribou, Boulder Co., alt. 10,200 ft., June 12, 1919, *Clokey 3294* (CAS, NY, M, Ry, G); above timber, Cameron Pass, alt. 12,500 ft., July 5, 1894, *Crandall* (P); vicinity of Gray's Peak, Aug., 1882, *Patterson & Beaty* (F); Silver Lake, alt. 3200 m., July 1, 1905, *Ramaley 1178* (Ry, C); rocky, grassy summit of a mountain east of Cameron Pass, Jackson Co., alt. 12,000 ft., July 21, 1935, *Williams 2444* (M TYPE, W, O, NY, G, ND, P); Estabrook, Park Co., July 26, 1919, *Young* (Cl).

19e. Mertensia viridis var. **cana** (Rydb.), comb. nov.

M. canescens Rydb. in Bull. Torr. Bot. Club **31**: 640. 1904, not Kauff., 1824.

M. cana Rydb. in Bull. Torr. Bot. Club **36**: 698. 1909.

Similar to var. *parvifolia;* cauline leaves linear to narrowly ovate, more or less densely canescent on both surfaces; calyx-lobes usually glabrous on the backs but sometimes slightly pubescent.

Distribution: north-central Colorado and Bald Mountain, Utah.

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[1] **Mertensia viridis** A. Nels., var. **parvifolia**, var. nov., foliis basalibus lanceolatis, 1.5–3 cm. longis, 0.5–1 cm. latis, subtus glabris, supra strigosis; foliis caulinis lineari-lanceolatis vel lanceolatis, 1–5 cm. longis, 0.2–1 cm. latis, subtus glabris, supra strigosis.

COLORADO: open hillsides, Caribou Mine, Boulder Co., alt. 10,200 ft., June 12, 1919, *Clokey 3292* (US, Ry, G, M, CAS, Clokey); dry hillside, Waldorf, Clear Creek, alt. 3660 m., Aug. 13, 1920, *Clokey 3848* (F, NY, G, P, M, UM, ANS, CAS, Ry, Pom, Clokey); Rocky Mountain National Park, July, 1926, *DeFrance* (Cl); Colorado Springs, July, 1880, *Gardner* (ANS); Rollins Pass, July 18, 1905, *Huestis* (C); coll. of 1906, *Johnston 354a* (Ry); Argentine Pass, alt. 12,000 ft., July 10, 1878, *Jones 54 in part* (C, G, NY, U); Milner Pass, Grand Co., alt. 10,500 ft., June 15, 1930, *Kiener* (W); Fall River Pass, Grand Co., alt. 11,500 ft., June, 1932, *Kiener* (W); alpine meadows near Milner Pass, near Estes Park, alt. 10,000–11,000 ft., June 21, 1932, *Mathias 419* (M); mountains of Estes Park, Larimer Co., July 22, 1903, *Osterhout 2847* (Ry); rocky slopes of mountains, between Tolland and Corona, Gilpin Co., alt. 3000 m., June 24, 1926, *Palmer 31281a, 31282a* (M); top Griffith Mountain, June 28–Aug. 7, 1875, *Patterson* (F); vicinity of Georgetown, June 28–Aug. 7, 1875, *Patterson* (F); high mountains, Gray's Peak and vicinity, alt. 11,000–14,000 ft., July, Aug. 28, 1885, *Patterson 113 in part* (G, NY); high mountains, Gray's Peak and vicinity, alt. 11,000–14,000 ft., July, Aug. 28, 1885, *Patterson 114* (ANS, UCal, G, M, F); Jenny Lake, June 29, 1909, *Ramaley 6366* (C); Corona, July 12 and 29, 1909, *Ramaley 6618, 6737* (Ry, C); Corona Lake, near Tolland, July 8, 1916, *Ramaley 10666* (C); Corona, July 18, 1918, *Ramaley 11387* (C); Redrock Lake about 4 miles west of Ward, Boulder Co., alt. 10,000 ft., July 19, 1912, *Ramaley & Robbins 9131* (C); Farnham, July 11, 1891, *Smith* (M); Berthoud Pass, Grand Co., alt. 11,000–12,000 ft., July, 1903, *Tweedy 5664* (Ry, NY TYPE *M. canescens* and *M. cana)*; rocky, grassy summit of a mountain east of Cameron Pass, Jackson Co., alt. 12,000 ft., July 21, 1935, *Williams 2445* (M, ND, O, P, NY, G, W); slopes of Mt. Chapin, Larimer Co., Aug. 14, 1927, *Woodson 1848a* (M); July 30, 1903, *Young* (F).

UTAH: Bald Mountain, Aug. 11, 1911, *Clemens* (Pom).

Mertensia viridis and its varieties and the closely allied species *M. Bakeri* and its variety present one of the most difficult problems of the smaller species of *Mertensia*.

The species *M. viridis* is extremely variable both as to size and shape of foliage and flower structure. There is apparently a trimorphic or at least a dimorphic condition of the stamens and style, with variations. The greater part of the material has the filaments longer than the anthers, hence the base of the stamens is much above the fornices, and the style exceeding the anthers. When this condition prevails the corolla-tube is longer than the limb. The other extreme has the filaments shorter than or equal to the anthers, hence the base of the anthers is about equal to the fornices, the style not reaching to the anthers. When this condition prevails the flowers are not only smaller, generally, but the corolla-tube is shorter than the corolla-limb. Between these two extremes is an intermediate condition in which the filaments are shorter than or equal to the anthers and the stigma may reach or surpass the stamens (rarely shorter). In this case the corolla-tube may be longer or shorter than the corolla-limb.

Mertensia viridis probably has been derived from or has given rise to *M. alpina;* in some few cases they nearly intergrade.

The synonyms listed above are nearly all various phases of the species, based either on leaf characters or on the corolla structure.

Mertensia viridis var. *dilatata* is an unimportant variation which takes the place of the species in the Medicine Bow Mountains of Wyoming and adjacent Colorado.

Mertensia viridis var. *caelestina* takes the place of the species in New Mexico. It differs in having the leaves glabrous, the calyx longer, and the flowers larger.

Mertensia viridis var. *cynoglossoides* is a peculiar robust variation which seems not to have been found since the original collections on which Greene based the two species, in synonymy under this variety.

Mertensia viridis var. *parvifolia* is an interesting variation of the species. It might be taken as an extreme variation of *M. viridis* from a study of herbarium material alone. In the field growing in close proximity, they seem amply distinct species, but a consideration of herbarium material shows intergradation between the two; further, the differences by which they may be separated are rather evasive, and the author is not certain that they can always be "spotted" in herbarium material.

Mertensia viridis var. *cana* is a further phase of var. *parvifolia* and has been found growing with that variety. The occurrence of the two varieties intermixed is apparently not uncommon. The relationship of the variety *cana* may be significant. It is possible that *M. viridis* and *M. Bakeri* may be related through var. *cana* and its close ally var. *parvifolia*. *Mertensia viridis* and both varieties *parvifolia* and *cana* were observed growing in close proximity on a mountain near Cameron Pass, Colorado. The species was just at anthesis while both varieties were well past this stage.

20. Mertensia Bakeri Greene, Pittonia **4**: 90. 1899.

M. paniculata var. *nivalis* S. Wats. in U. S. Geol. Expl. 40th Par. [Bot. King's Exped.] **5**: 239. 1871.

M. nivalis Rydb. in Mem. N. Y. Bot. Gard. **1**: 336. 1900.

M. lateriflora Greene, Pl. Baker. **3**: 18. 1901.

M. Bakeri lateriflora A. Nels. in Coult. & Nels., Man. Ry. Mt. Bot. 423. 1909.

M. myosotifolia Heller[1] in Rydb., Colo. Agr. Exp. Sta. Bull. [Fl. Colo.] 100: 292. 1906, *nomen subnudum;* Rydb., Fl. Ry. Mts. and Adj. Plains, 734. 1918, and ed. 2, 1923, description.

M. refracta A. Nels. in Bot. Gaz. **56**: 69. 1913.

M. lanceolata var. *myosotifolia* Macbr. in Contr. Gray Herb. N. S. No. 48: 15. 1916.

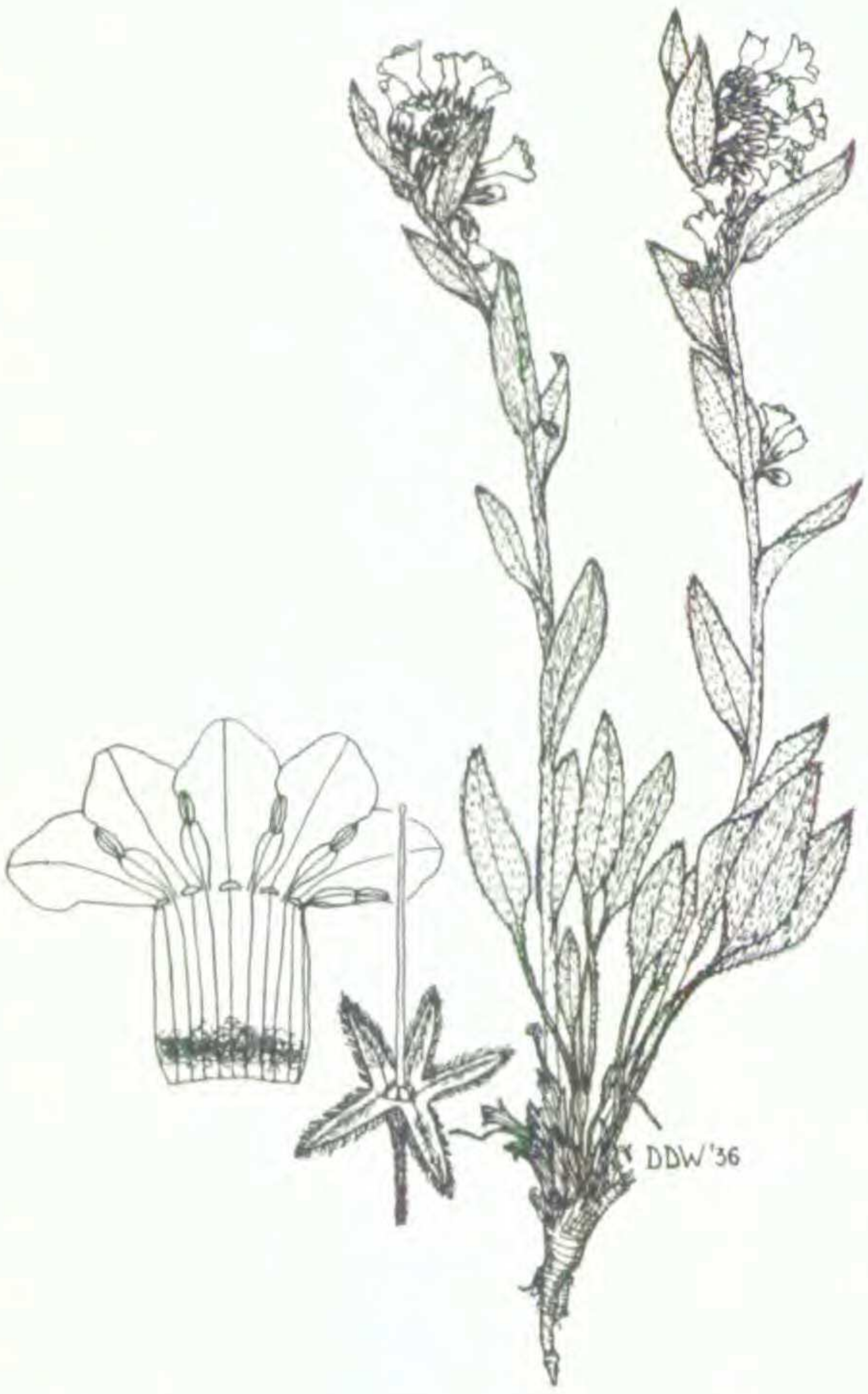

Fig. 12. *M. Bakeri.* Habit sketch × ⅓; enlarged flower × 1⅔.

Stems erect or ascending, 1–several from each rootstalk, 0.8–4 dm. tall, simple or rarely branched, pubescent with soft hairs; basal leaves linear-lanceolate to ovate-elliptic, more or less densely canescent on both surfaces, 2–11 cm. long (mostly 4–6 cm.), 0.5–3.5 cm. broad (mostly 1–1.5 cm.), petiole longer or shorter than the blade; cauline leaves linear-lanceolate to ovate, usually more or less densely canescent on both surfaces, some plants

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[1] This name appears in Rydberg's 'Flora of Colorado,' giving only a locality, and only incidental description in the keys. A collection made by Mr. Geo. E. Osterhout No. 2164, bears the data given by Rydberg, and Heller's name as ''sp. nov.'' The specimen of this collection in Mr. Osterhout's herbarium is designated as type.

(from the Uinta Mountains, Utah) sparsely so, sessile or nearly so, semiamplexicaul, 1.5–8 cm. long (mostly 3–4 cm.), 0.5–2.5 cm. broad; inflorescence congested to loosely panicled; pedicels usually canescent, often reflexed in fruit, 1.5 cm. or less long; calyx 2.5–5 mm. long (mostly 3–3.5 mm.), divided almost to the base, sparsely to usually densely pubescent on the back and margins of lobes, lobes linear-lanceolate to lanceolate, acute, about 0.5 mm. shorter than the entire calyx; flowers di-, possibly trimorphic, the tube typically longer than the limb; corolla-tube with a more or less definite ring of hairs toward the base within, 3.5–9 mm. long; corolla-limb moderately expanded, 4–6 mm. long; anthers 1.2–2 mm. long (mostly 1.5 mm.), shorter and narrower than the normal phase, longer and broader in dimorphic phases; fornices usually prominent, glabrous, papillose or pubescent; style reaching or surpassing the anthers; nutlets rugose, 2.5–3.5 mm. long.

Distribution: mountains of Colorado and Uinta Mountains, Utah, south to northern New Mexico.

COLORADO: Carson, region of the Gunnison Watershed, alt. 11,500–12,000 ft., July 2, 1901, *Baker 293* (G, US, ND, M, Pom); same locality and date, *Baker 334* (US, O, ND, Pom, P, G, M, Ry, UCal); Marshall Pass, region of the Gunnison Watershed, alt. 12,000 ft., July 19, 1901, *Baker 497* (O, ND, M, P, US, G, Ry, UCal, Pom); mountains above Ouray, region of the Gunnison Watershed, alt. 12,000 ft., Aug. 10, 1901, *Baker 773* (M, ND, Ry, US, NY, UCal, G, Pom); on bare summits, Hayden Peak, alt. 13,000 ft., July 14, 1898, *Baker, Earle & Tracy 576* (ND TYPE, G, O, M, Cl, Ry, Clokey, US, AM, UCal, Pom, F); Palsgrove Cañon, alt. 2800 m., June 27, 1901, *Clements & Clements 324* (N, M, G, Ry, Cl, US); dry open soil, Pitkin, alt. 9200 ft., Sept. 12, 1917, *Clokey 2999* (Clokey); meadow, Grizzly Peak, alt. 10,800 ft., July 5, 1918, *Clokey 3522* (Pom, O, UM, M, Ry, G, Clokey, CAS, P, US); mountain northwest of Como, alt. 12,000 ft., July 31, 1895, *Cowen 1808* (FC); fairly common, dry alpine meadow, stony soil, James Peak, alt. 11,500 ft., July 2, 1928, *Cox 11* (F); plateau above timber, mountain northwest of Como, alt. 12,000 ft., July 31, 1895, *Crandall & Cowen 359* (US); Clover Mountain, above Garfield, alt. 3900 m., July 31, 1910, *Eggleston 6059* (US); alpine, rocky heights, ''The Bluffs,'' Spicer, Larimer Co., July 10, 1903, *Goodding 1519 in part* (O, ANS, C, US); meadows, moist east slopes, Wagon-wheel Gap, alt. 9000 ft., July 28, 1912, *Griffin 139* (Ry, G); St. Elmo, alt. 10,000 ft., June, 1886, *Harper in part* (CAS); Boreas, July 11, 1904, *Huestis* (C); rocky hill near Wagon-wheel Gap, Mineral Co., alt. 8700 ft., June 6, 1911, *Murdoch 4547* (Pom); Monarch Pass, between Salida and Gunnison, Aug. 5, 1920, *Nelson* (Ry, G, M, UCal); Horse Thief Trail, timberline, Ouray, Aug. 10, 1920, *Nelson 9828* (Ry, M, G, UCal); Horse Thief Trail, Ouray, Aug. 10, 1923, *Nelson 9859* (Ry); Red Cliff, Eagle Co., June 26, 1900, *Osterhout 2164* (UCal, O, M, C, Ry, G); Horse Thief Trail, Ouray, Ouray Co., June

29, 1927, *Osterhout 5355* (O); Monarch Pass, Saguache Co., June 29, 1927, *Osterhout 6828* (O); among rocks, near Trout Lake, San Miguel Co., alt. 12,000 ft., Aug. 21, 1924, *Payson & Payson 4185* (UCal, O, M, Ry, G); Mt. Corduroy, July 2, 1876, *Popenoe* (K); side of mountain, Bear Creek, Uncompahgre River, alt. 11,000–13,000 ft., July–Aug., 1893, *Purpus 548* (F); La Plata Mountains, alt. 11,500 ft., July 20, 1896, *Tweedy 552* (US).

NEW MEXICO: among rocks on summit, on and near the Sierra Grande, Union Co., alt. 2100–2925 m., June 19, 1911, *Standley 6151* (US atypical).

UTAH: rocky summit, Mt. Agassiz, Duchesne Co., alt. 12,500 ft., July 10, 1928, *Cottam 3713* (F); Bald Mountain, Uinta Mountains, Duchesne Co., alt. 11,000 ft., Aug. 7, 1930, *Garrett 5698* (F); among moraines, Fish Lake, Uinta Mountains, July 17, 1902, *Goodding 1386* (Cl, US, G, M, Ry, Pom); grassy eastern slopes among rocks, above East Fork of Bear River, Uinta Mountains, Summit Co., alt. 11,700 ft., Aug. 18, 1932, *Goodman 1971* (M); along divide between East Fork of Bear River and Black's Fork, Uinta Mountains, Summit Co., alt. 10,000 ft., July 9–13, 1930, *Goodman & Hitchcock 1523* (M, O, UCal, F); ridge north-northwest of Paradise Park, 6 miles west of Marsh Peak, Uinta Basin, Uintah Co., alt. 11,300 ft., July 8, 1933, *Graham 8424* (M, Carnegie, W); above trees in meadow, north of Chain Lakes, southeast of Mt. Emmons, Uinta Basin, Duchesne Co., alt. 11,400 ft., July 20, 1933, *Graham 8565* (M, Carnegie, W); barren, rocky southeast slope, Mt. Emmons, Duchesne Co., alt. 12,300 ft., July 20, 1933, *Hermann 5150* (G); barren rock slide, southeast cirque, Mt. Emmons, Duchesne Co., alt. 12,200 ft., July 22, 1933, *Hermann 5208* (G); crevices in loose rock, barren northwest slope, Lamotte Peak, Summit Co., alt. 11,800 ft., Aug. 15, 1933, *Hermann 5978* (G); above timber, southwest slopes of Bald Mountain, Summit Co., alt. 11,500 ft., Aug. 14, 1935, *Maguire, Richards & Maguire 4237* (U, G, UCal); Mt. Lofty, Divide-Weber and Bear River, Summit Co., alt. 11,300 ft., Aug. 3, 1932, *Maguire, Richards & Maguire 4238* (U, G); above timber, southwest slopes of Bald Mountain, Summit Co., alt. 11,500 ft., Aug. 14, 1933, *Maguire, Richards & Maguire 4239* (U, G); rocky west slopes Mt. Agassiz, Duchesne Co., alt. 11,600 ft., Aug. 16, 1933, *Maguire, Richards & Maguire 4240* (G, U, UCal); common among rocks on upper part of peak, West Fork of Bear River, Uinta Mountains, Summit Co., alt. 10,700 ft., July 7, 1926, *Payson & Payson 4913* (Pom, G, US, M, ANS, P, Ry, UCal); among rocks, Lamotte Peak, Uinta Mountains, Summit Co., alt. 12,000 ft., July 19, 1926, *Payson & Payson 5025* (Pom, P, ANS, M, Ry, US, UCal); among rocks, Lamotte Peak, alt. 12,000 ft., July 24, 1926, *Payson & Payson 5086* (Ry); slide rock, basin west of Lamotte Peak, Uinta Mountains, Summit Co., alt. 10,000 ft., July 27, 1926, *Payson & Payson 5137* (Ry); Bear River Cañon, alt. 11,500 ft., Aug., 1869, *Watson 844* (US, G TYPE *M. paniculata* var. *nivalis*, NY).

20a. **Mertensia Bakeri** var. **Osterhoutii**, var. nov.[1]

Similar to the species; pubescence of both surfaces of leaves spreading, almost absent on lower surfaces in a few specimens; calyx-lobes glabrous to sparingly pubescent on the back.

Distribution: Colorado.

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[1] **Mertensia Bakeri** Greene, var. **Osterhoutii**, var. nov., speciei similis sed pubescentia foliorum utrinque divergente; calycis laciniis glabris vel sparse pubescentibus.

COLORADO: Breckenridge, coll. of 1887, *Bereman 770* (M); alpine, rocky heights, "The Bluffs," Spicer, Larimer Co., July 10, 1903, *Goodding 1519 in part* (ANS, C, US, G, Cl, M, Ry, UCal); Rocky Mountains, coll. of 1862, *Hall & Harbour 444* (F, M, ANS, Cl); near Breckenridge, 110 miles from Denver, on the South Park Line of the Union Pacific Railway, alt. 10,000 ft., May 27–28, 1896, *Holzinger 47* (FC); Sulphur Springs, Grand Co., June 8, 1906, *Osterhout 3225* (O, Ry TYPE, AM, G); Wolcott, Eagle Co., May 25, 1910, *Osterhout 4240* (O); Granby, Grand Co., June 21, 1906, *Osterhout 6066* (O); dry grassland, Tolland, June 16, 1909, *Ramaley 6266* (C); Park Lake, Tolland, May 31, 1911, *Ramaley 8681* (C); dry grassland, Park Lake, Tolland, May 11, 1911, *Ramaley 8689* (C, US); dry grassland, Tolland, June 14, 1913, *Ramaley 9530* (C); dry grassland, at a small lake one-fourth mile below Tolland, alt. 8800 ft., June 7, 1908, *Ramaley & Robbins 4628* (C); East Lake, Tolland, May 29, 1910, *Robbins 7554* (C); alpine, Fall River cirque, Rocky Mountain National Park, June 18, 1932, *Sperry* (N); Eldora to Baltimore, alt. 8500–9500 ft., June 20–July 10, 1903, *Tweedy 5665* (Ry); Boulder Park, alt. 3000 m., July, 1901, *Wheeler 347* (C, Ry); Rollinsville, alt. 2800 m., July, 1901, *Wheeler 363* (C); Montezuma, June, 1873, *Wolfe 710* (Cl, US, F).

Mertensia Bakeri var. *Osterhoutii* differs from the species in the rather poor characters given above which, however, seem to be constant. In addition, the variety dries a clear green color while the species almost invariably dries to a sordid brown. The corolla dries blue while that of the species dries a much darker blue or purple.

Mertensia Bakeri and its variety and *M. viridis* and its varieties form a most complex assemblage, the entities of which are not always clear cut and easily defined. In *M. Bakeri* there is a tendency toward dimorphic flowers which, however, is not so great as in *M. viridis*. The specimens of *M. Bakeri* from the Uinta Mountains, Utah, are, on the whole, less pubescent than most of the material from Colorado. The collection which is typical of *M. myosotifolia* is in part not typical of *M. Bakeri*, but it is only a minor variation.

21. **Mertensia MacDougalii** Heller in Bull. Torr. Bot. Club **26**: 550. 1899.

Stems ascending, 8–25 cm. tall, one to few from each indurated root; basal leaves petiolate, oblong-oval to oval, glabrous, usually pustulate above, the blade 2–5 cm. long, 1–4 cm. broad; cauline leaves sessile, oblong-lanceolate to ovate, 2–6 cm. long, 0.5–2 cm. broad, glabrous or usually pustulate above, lateral veins inconspicuous or none; pedicels 1–10 mm. long, glabrous; inflorescence a modified scorpioid cyme, not much elongated in fruit; corolla blue, the tube 8–9 mm. long, glabrous within, the moderately expanded limb 5–6 mm. long; fornices conspicuous, glabrous; anthers 2.5–3 mm. long; filaments 2.5–3 mm. long, about as broad as the anthers; style as long as or usually exceeding the corolla; calyx 5–6 mm. long, (up to 10 mm. in fruit), the lobes narrowly ovate to lanceolate, obtuse or acute, ciliate, otherwise glabrous, 3–4 mm. long, increasing in size with age; nutlets rugose on the back, inner surface slightly concave, the margins forming a collar.

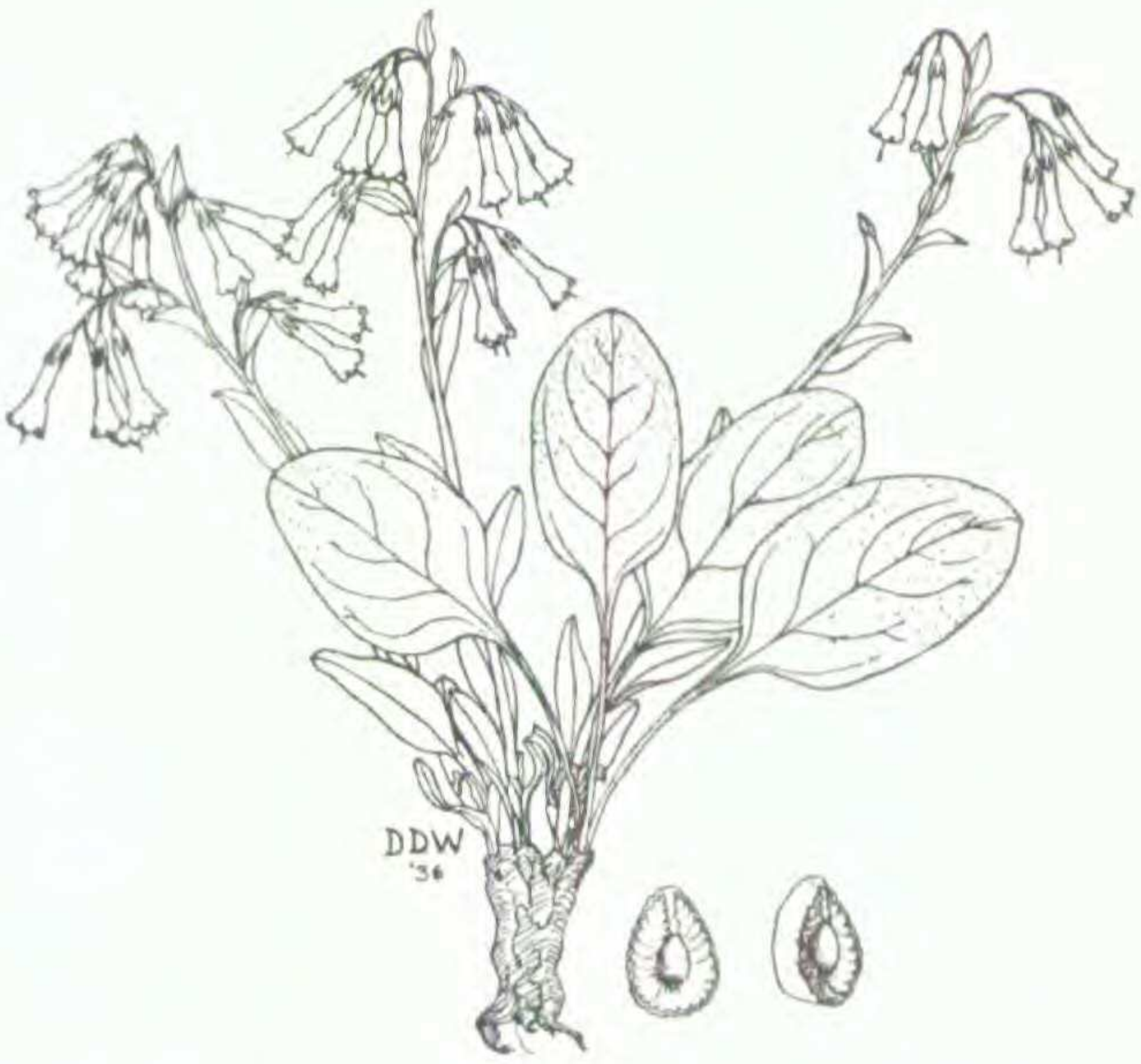

Fig. 13. *M. MacDougalii.* Habit sketch × 1/3; nutlets × 1⅔.

Distribution: Coconino and Yavapai Counties, Arizona.

ARIZONA: Ft. Whipple. April 26, 1865, *Coues & Palmer 299* (M, G); rich soil near Grand Canyon, alt. 9000 ft., June 12, 1891, *MacDougal* (NY); about Mormon Lake, alt. 6000 ft., June 12, 1898, *MacDougal 95* (NY TYPE, UCal, F, Cl); Oak Creek Canyon near Flagstaff, June 4, 1929, *McKelvey* (CAS); forest between Grand View and Desert View, Grand Canyon, 7400 ft., Coconino Co., May 12, 1922, *Wiegand & Upton 4130* (Cl).

This species has been rarely collected and from the few specimens seen it must be quite restricted in its range. The nutlets show a departure in structure which readily sets the species off from the rest in the genus. In a genus where the characters of the nutlets vary so little this departure is of interest.

22. Mertensia oblongifolia (Nutt.) G. Don, Gen. Hist. **4**: 372. 1838.

M. nutans subsp. *subcalva* Piper in Contr. U. S. Nat. Herb. [Fl. Wash.] **11**: 479. 1906.
M. foliosa var. *subcalva* Macbr. in Contr. Gray Herb. N. S. No. 48: 18. 1916.
M. Nelsonii Macbr., *l.c.* 19, in part.
M. Bakeri var. *subglabra* Macbr. & Payson in Contr. Gray Herb. N. S. No. 49: 66. 1917.
M. foliosa var. *subcalva* f. *Macbridei* Johnston in Contr. Arnold Arb. No. 3: 84. 1932.
Pulmonaria oblongifolia Nutt. in Jour. Acad. Nat. Sci. Phila. **7**: 43. 1834.
Cerinthodes oblongifolium O. Kuntze, Rev. Gen. Pl. pt. 2: 436. 1891.

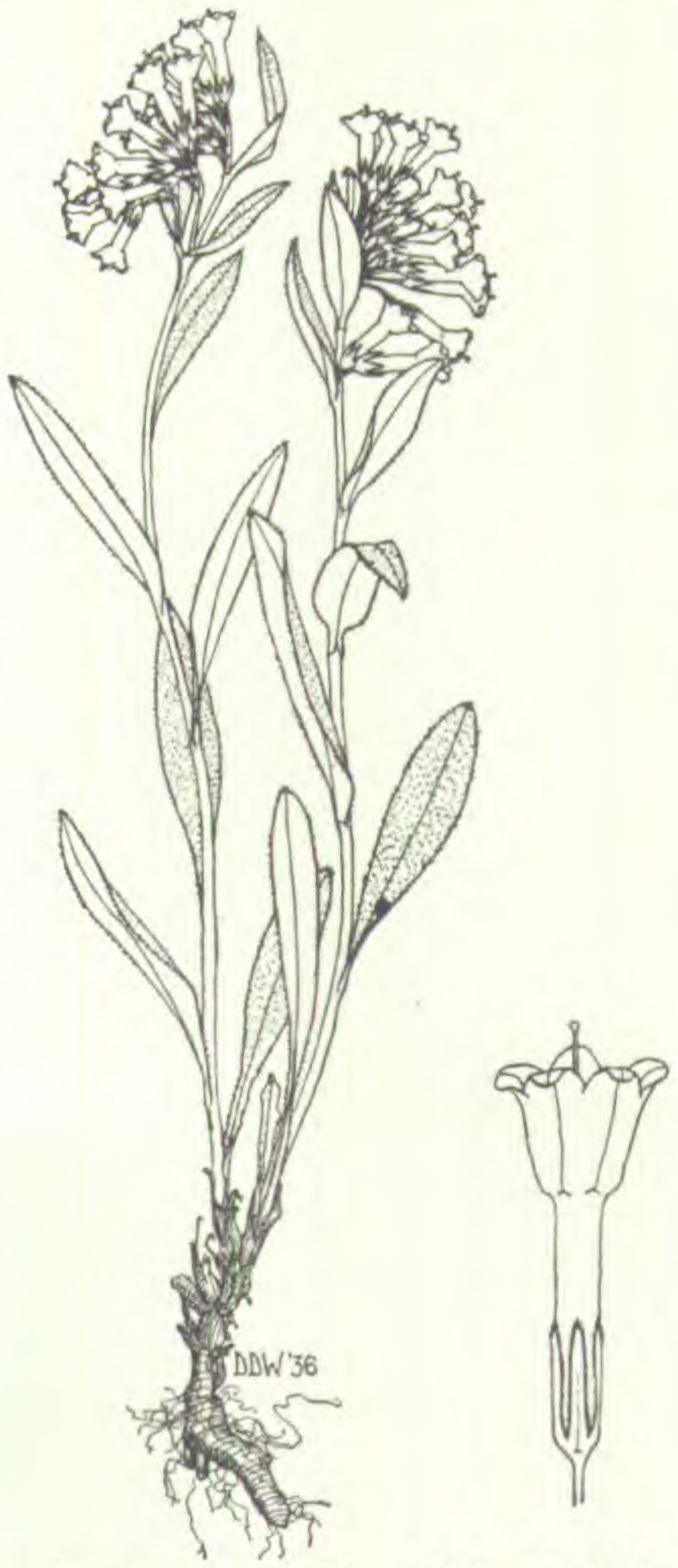

Fig. 14. *M. oblongifolia.* Habit sketch × ⅓; enlarged flower × 1⅓.

Stems erect or ascending, 1–3 dm. tall, one to many from each elongated rootstalk; blade of basal leaves 3–8 cm. long, 0.5–2 cm. broad, oblong or spatulate to narrowly oblong-ovate, usually obtuse, strigose on the upper surface, glabrous below, petiole longer or shorter than the blade; cauline leaves sessile or the lowermost short-petiolate, linear to oblong-elliptical, 2–8 cm. long, 0.3–1.5 cm. broad, pubescence as of basal leaves; inflorescence congested, becoming panicled with age; pedicels strigose to essentially glabrous, 1–10 mm. long; calyx 3–7 mm. long, divided to within about 1 mm. of the base, the lobes linear to lanceolate-triangular, acute, ciliate, glabrous dorsally or rarely with a few hairs; corolla-tube 5–12 mm. long, usually quite glabrous within, occasionally with a few scattered hairs;

corolla-limb 4–7 mm. long; anthers 1.2–2 mm. long, oblong and straight; filaments 2–4 mm. long, usually longer and broader than the anthers; style exceeding the anthers; fornices prominent, glabrous or occasionally sparsely hairy; immature nutlets 3–4 mm. long, rugose; mature nutlets not seen.

Distribution: western Montana, Wyoming, and Utah to Washington and northern California.

MONTANA: foothills, Bozeman, May 23, 1899, *Blankinship in part* (G, M); hillside thickets, Bozeman, May 27, 1899, *Blankinship* (Ry, M); plains, Bozeman, May 11, 1900, *Blankinship* (G); Leveridge Canyon, Bozeman, May 20, 1900, *Blankinship* (U); Bozeman, May 10, 1901, *Blankinship* (FC, Ry); uplands, Bozeman, May 4, 1905, *Blankinship 374* (UM); upland plains, Bozeman, May 4, 1905, *Blankinship 374a in part* (ANS, F); upland plains, Bozeman, alt. 5000 ft., May 5–8, 1906, *Blankinship 374b in part* (M, Ry, F, UCal, N); foot of south slope of Bridger Mountain, May 14, 1900, *Chesnut & Jones 110* (US); Blackfoot River Canyon, 20–30 miles east of Missoula, June 6, 1918, *Collins* (G); Sedan, May 5, 1901, *Jones* (G); Bozeman, May 10, 1900, *Jones* (UCal); Bozeman, May 5, 1901, *Jones* (UCal); Bozeman, May 11, 1905, *Jones* (UCal); Bozeman, May 13, 1905, *Jones in part* (UCal); Camp Creek, Gallatin Co., June 12, 1905, *Jones* (UCal); Helena, May, 1889, *Kelsey 62 in part* (UM); Bozeman, May 5, *Kenney* (G); Bozeman, May 26, 1903, *Kimpton in part* (CAS); Mt. Sentinel, Missoula, April 25, *Maclay 41* (UM); Mt. Sentinel, May 14, 1925, *Merryfield* (UM); Bear Canyon, Gallatin Co., May 25, 1900, *Moore in part* (UCal); Bridger Canyon, Gallatin Co., May 15, 1901, *Moore in part* (UCal); Monida, June 16, 1899, *Nelson 5413a* (M, US); Livingston, May 25, 1901, *Scheuber* (US); Bozeman Pass, May 28, 1883, *Scribner 176* (US); Helena, May, 1893, *Starz* (M); Spanish Creek, May 12, 1901, *Vogel* (G); near Billings, May, 1890, *Wright* (UCal); Montana Territory, without collector's name (G); a fragment marked in Dr. Gray's hand, "*M. oblongifolia* Nutt.!, ex sp. Wyeth, misit Durand 1861" is probably from the TYPE specimen, *Wyeth* (G); Flathead River, *Wyeth* (?) (M photograph of specimen in ANS).

WYOMING: dry soil, Leucite Hills, June 17, 1901, *Merrill & Wilcox 698* (Ry, G); on the broken cliffs, Steamboat Mountain, Sweetwater Co., June 9, 1900, *Nelson 7072* (Pom, M, Ry, N); moist banks, Hoback Canyon, May 20, 1924, *Nelson 10082* (M, UM, G, Ry); Yellowstone Park, coll. of 1885, *Tweedy* (US); Swan Lake, Yellowstone Park, June, 1885, *Tweedy 813* (US); sagebrush slope in Hoback Canyon, near the "East Rim," Sublette Co., alt. 8000 ft., May 29, 1935, *Williams & Williams 2156* (Cl, W, M); Hoback Canyon, Sublette Co., April 29, 1934, *Williams 20* (W).

IDAHO: in coniferous forest, Sawtooth Mountains, Payette River, Boise Co., June 18, 1930, *Applegate 6303 in part* (G); Bannock Co., May, 1932, *Davis D23–32* (F); deep, loamy soils on hillsides, Lost River Mountains, Blaine Co., July 10, 1916, *Macbride & Payson 3143 in part* (CAS, Ry, Pom, M, G, UCal); open hillsides, Josephus Lakes, Custer Co., Aug. 3, 1916, *Macbride & Payson 3544* (M, UCal, CAS, Pom, G TYPE *M. Bakeri* var. *subglabra*, Ry, US); Juniper Hills, 10 miles west of St. Anthony, May 3, 1919, *Quayle 15* (Pom); Sawtooth National Forest, coll. of 1910, *Woods 34a, 35a* (Ry).

UTAH: Canyon, west of Steptoe Valley, May 15, 1859, *Engelmann* (M); head of South Fork of Humboldt River, May 19, 1859, *Engelmann* (M).

NEVADA: Victory Highway, Emigrant Pass, Eureka Co., June 10, 1933, *Eastwood & Howell 209 in part* (G, CAS, W); Clover Mountain Range near Deeth, East Humboldt or Ruby Mountains, Elko Co., alt. 9300 ft., July 24, 1908, *Heller 9181* (G, M); south side of Star Canyon near Deeth, Ruby Mountains, alt. 9100 ft., July 8, 1912, *Heller 10541* (G, CAS, UCal, F, Pom); south side of Star Canyon near Deeth, Ruby Mountains, alt. 8500 ft., July 8, 1912, *Heller 10546* (M); Aurum, July 9, 1891, *Jones* (Pom); East Humboldt Mountains, alt. 9000 ft., July 14, 1902, *Jones* (Pom); Aurum, alt. 7300 ft., May 30, 1893, *Jones* (Pom); Little Lakes Canyon, West Stampede, Elko Co., June 13, 1902, *Kennedy 511* (Ry); slopes above snow banks, Jarbidge, alt. 8000 ft., July 6, 1912, *Nelson & Macbride 1938 in part* (G); shaded cliffs, Jarbidge, July 9, 1912, *Nelson & Macbride 1995 in part* (Ry TYPE *M. Nelsonii);* East Humboldt Mountains, alt. 7000 ft., July, 1865, *Watson 841* (G, US).

WASHINGTON: Rattlesnake Mountains, Yakima Region, April 29, 1901, *Cotton 328* (Ry, US TYPE *M. nutans* subsp. *subcalva,* M, G, P); dry hillside, near Dutch John's, April 23, 1899, *Whited 1034 in part* (G).

OREGON: along Silvies River, near mouth of Emigrant Creek, Harney Co., June 24, 1912, *Peck 5588* (G).

CALIFORNIA: Goose Lake Valley, July, 1895, *Austin 511* (US, Pom); Goose Lake Valley, June, 1898, *Austin & Bruce 2260 in part* (UCal); canyons, Modoc Co., June, 1898, *Austin & Bruce 2261* (UCal); sunny open slopes, thickets in meadows, Fort Bidwell, Modoc Co., April 19, 1903, *Manning 83 in part* (US).

22a. Mertensia oblongifolia var. **nevadensis** (A. Nels.), comb. nov.

M. foliosa A. Nels. in Bull. Torr. Bot. Club **26**: 243. 1899.
M. tubiflora Rydb. in Bull. Torr. Bot. Club **26**: 544. 1899.
M. intermedia Rydb. in Mem. N. Y. Bot. Gard. **1**: 335. 1900.
M. nutans Howell, Fl. N. W. Am. 491. 1901.
M. stenoloba Greene, Pl. Baker. **3**: 20. 1901.
M. symphytoides Greene, *l.c.,* non Fisch., 1872.
M. coronata A. Nels. in Bull. Torr. Bot. Club **29**: 403. 1902, as to type specimen mainly.
M. nevadensis A. Nels. in Proc. Biol. Soc. Wash. **17**: 96. 1904.
M. praecox Smiley ex Macbr. in Contr. Gray Herb. N. S. No. 48: 10. 1916.
M. foliosa var. *nevadensis* Macbr., *l.c.* 19.
M. Nelsonii Macbr., *l.c.,* in part as to type specimen.

Similar to the species but often more robust; cauline leaves 2–10 cm. long, 0.8–6 cm. broad, lanceolate-oblong to ovate, glabrous or the upper surface pustulate, sometimes the pustules toward the apex of the leaves developing mucros, some specimens, particularly from northeastern Utah, with lateral veins in the well-developed cauline leaves; corolla extremely variable as to size in different localities and at different stages of anthesis.

Distribution: western Montana and Wyoming west to Washington and northern California.

MONTANA: Pleasant Valley, June 25–30, 1871, *Allen in part* (US); Mt. Sentinel, Missoula, alt. 3200 ft., April 28, 1927, *Anderson 7* (UM); Belt Creek, June, 1883, *Anderson* (UM); coll. of 1895, *Anderson 252* (UCal); Belt Mountains, June 29, 1885, *Anderson 305* (UM); Belt Mountains, July 8, 1886, *Anderson 5855* (NY); Missoula, coll. of 1903, *Blankinship* (UM); Anaconda, May 25, 1906, *Blankinship* (UCal, Ry); wooded slopes, Mt. Bridger, alt. 8000 ft., July 5, 1905, *Blankinship 375* (M, ANS, UM, F); near springs, Tobacco Mountains, alt. 5000–6000 ft., July 13, 1909, *Butler 4186* (NY, CAS); northern slope, foot of Mt. Sentinel, alt. 3320 ft., May 14, 1924, *Cramer* (UM); Mt. Sentinel, April 28, 1927, *Darlington 4* (UM); 4 miles northwest of Red Lodge, Carbon Co., May 14, 1905, *Draper* (UCal); Greycliff, Sweet Grass Co., alt. 1200 m., May 6–12, 1913, *Eggleston 9007* (US); grassy slopes, Missoula, May, *Elrod* (Clokey); Missoula and vicinity, *Elrod 9* (UM); Bridger Mountains, near the Pass, alt. 8000 ft., July 28, 1896, *Flodman 752* (M, ND TYPE *M. stenoloba*); dry, grassy, gravelly soil, Mt. Sentinel, southeast of Missoula, alt. 3600 ft., May 4, 1933, *Hitchcock 1530* (G, UM, CAS, Pom); prairies, Missoula, alt. 3200 ft., May, 1917, *Hughes 1261* (G, UM, M); Monida, alt. 7000 ft., July 8, 1909, *Jones* (Pom); Lima, July 14, 1908, *Jones 8658* (UM, G); Lima, July 14, 1908, *Jones 8858* (Pom); Bridger Mountains, May 25, 1900, *Jones* (UCal); Old Baldy, Bozeman, May 26, 1900 *Jones* (UCal); Bridger Mountains, June 27, 1901, *Jones* (M, Ry, UCal); Bridger Mountains, June 1, 1905, *Jones* (UCal); Helena, May, 1891, *Kelsey* (F); Miller Canyon, near Missoula, alt. 3600 ft., May 20, 1922, *Kirkwood 1259* (G, UM, M); forest, Bonner, alt. 4000 ft., May 28, 1921, *Kirkwood 1260* (G, UM, M); grassy slopes, Missoula, alt. 3300 ft., May 9, 1923, *Kirkwood 1362* (G, UM, CAS, F); foot of Mt. Sentinel, Missoula, alt. 3200 ft., May 14, 1922, *Kirkwood 1731* (Ry, G, UM, CAS, F); Hellgate Canyon, 2 miles east of Missoula, alt. 3500 ft., May 5, 1925, *Kirkwood 2057* (Ry, G, UM); 2½ miles up Blackfoot, Bonner, alt. 3800 ft., May 25, 1926, *Kirkwood 2514* (G, UM, Ry); dry gravelly open south slope, Missoula, alt. 4000 ft., April 8, 1915, *Kittredge* (G); campus, Missoula, alt. 3200 ft., May 12, 1924, *Larsen* (UM); Old Sentinel, mountain near Missoula, alt. 3500 ft., June 12, 1901, *MacDougal 187* (UM); among sagebrush on a moist slope, Monida, Madison Co., June 16, 1899, *Nelson & Nelson 5413 in part* (M); Monida, June 16, 1899, *Nelson 5413a in part* (Ry); Missoula, June, 1902, *Ronan 74* (UM); Old Hollowtop, near Pony, alt. 9000 ft., July 9, 1897, *Rydberg & Bessey 4869* (US); Bridger Mountains, alt. 7000 ft., June 15, 1897, *Rydberg & Bessey 4870* (G, P, Ry, N, US, UM, F); Cedar Mountain, alt. 10,000 ft., July 16, 1897, *Rydberg & Bessey 4871* (US); Bridger Mountains, alt. 7000 ft., June 18, 1897, *Rydberg & Bessey 4873 in part* (NY TYPE *M. intermedia*); Bridger Mountains, alt. 7000 ft., June 17, 1897, *Rydberg & Bessey 4874* (NY); Bozeman Pass, May 28, 1883, *Scribner 176* (G, ANS); foothills, Deerlodge, April 27, 1888, *Stapleton 53 in part* (UM); west slope of Mt. Sentinel, near Missoula, alt. 3300 ft., April 16, 1921, *Steward 366* (UM); Blackfoot Valley, near Missoula, alt. 3500 ft., May 28, 1921, *Steward 480* (UM); Missoula meadow, April 16, 1912, *Trask* (N); hills, Midvale, June 24, 1903, *Umbach 151* (NY, AM, F); mountain sides, Midvale, June 28, 1903, *Umbach 190* (AM); plains, Midvale, July 4, 1903, *Umbach 190a* (F); moist slope, Mt. Sentinel, alt. 3200 ft., May, 1924, *Williams* (UM).

WYOMING: moist ground above Trapper Canyon near Brush Butte, Big Horn Co., May 2, 1926, *Finley 5* (Ry); western slope of Wind River Mountains, alt. 7800 ft., June 3, 1860, *Hayden* (M); Gros Ventres Fork, alt. 7800 ft., June 5, 1860, *Hayden* (M); Jackson, May 22, 1928, *Murie 124* (Ry); Evanston, May 28, 1897, *Nelson 2951* (M, Ry TYPE *M. foliosa*, Cl, G, N); North Vermillion Creek, July 24, 1897, *Nelson 3593* (Ry); among the great rocks, often in shade, Leucite Hills, Sweetwater Co., June 9, 1900, *Nelson 7071* (Ry TYPE *M. coronata*, C, G); moist sagebrush slopes, Cumberland, Uintah Co., May 31, 1907, *Nelson 9007* (UCal, Ry, G); moist draws, Kemmerer, Uintah Co., June 1, 1907, *Nelson 9016* (UCal, Cl, Ry, G, M); moist banks, Hoback Canyon, May 20, 1924, *Nelson 10082* (UCal); among sagebrush, dry hillside, 5 miles west of Kemmerer, June 20, 1923, *Payson & Armstrong 3232A* (Ry, M); up the Red Grade from Big Horn, Big Horn Mountains, Sheridan Co., May 25, 1934, *Rollins 478* (W); Evanston, May 15, 1883, *Sanford* (UCal); headwaters of Tongue River, Big Horn Mountains, July, 1898, *Tweedy 119* (NY TYPE *M. tubiflora); Big* Horn, Sheridan Co., alt. 6000 ft., July, 1899, *Tweedy 2601* (NY, Ry); among sagebrush, 15 miles east of Kane, hillside, western slope, Big Horn Mountains, Big Horn Co., alt. 9000 ft., July 5, 1935, *Williams 2353* (M, W); rocky ridges, Bryan Flats, alt. 7000 ft., April 30, 1933, *Williams & Pierson 1071* (M, W); rocky knoll among sagebrush, or in open, 3 miles east of Evanston, Uintah Co., May 24, 1935, *Williams & Williams 2142* (M, W); northern slope, sagebrush hill, about 5 miles north of Kemmerer, Lincoln Co., May 28, 1935, *Williams & Williams 2155* (M, Cl, W); sagebrush slope in Hoback Canyon near the "East Rim," Sublette Co., alt. 8000 ft., May 29, 1935, *Williams & Williams 2156* (Cl, W); among sage and pine just below V-V Ranch in Hoback Canyon, Sublette Co., alt. 6500 ft., May 29, 1935, *Williams & Williams 2159, 2160* (M, W); in quaking aspen grove near mouth of Hoback River, Teton Co., alt. 6000 ft., June 3, 1935, *Williams & Williams 2166* (M, W).

IDAHO: open places on hillsides, Twin Falls, May 5, 1912, *Bennitt 20* (Ry); Ketchum, *Broadhead* (Pom); near Caldwell, Canyon Co., April 15, 1934, *Christ 6238* (G); moist hillside above old university farm, alt. 5000 ft., April 18, 1932, *Davis* (W); Pocatello, coll. of 1926, *Donaghe* (CAS); Iverson Brothers Ranch, Minidoka Forest, Cassia Co., alt. 2000 m., June 19, 1917, *Eggleston 13841* (US); near Boise, coll. of 1916, *Gageby* (Ry); east of Preston, April 30, 1909, *Henderson 19* (Ry); in sage grass, Lemhi Forest, alt. 7200 ft., May 17, 1927, *Johnson* (UIdaho); Oxford, southeast Idaho, Bannock Co., April 3, 1885, *Leonard* (G); Oxford, April 10, 1885, *Leonard* (K); southeastern Idaho, May 7, 1885, *Leonard 32* (NY); slopes along streams, Silver City, Owyhee Co., alt. 7000 ft., June 20, 1911, *Macbride 942* (F, P, M, UCal, Pom, Ry, G); sagebrush slopes, south end of Soldier Mountain, Blaine Co., alt. 7500 ft., June 26, 1916, *Macbride & Payson 2890* (UCal, G, Ry, M, Pom, CAS); sheltered moist places, Martin, Blaine Co., alt. 7000 ft., July 6, 1916, *Macbride & Payson 3065* (Ry); on rocky hillsides, Martin, Blaine Co., alt. 6400 ft., July 7, 1916, *Macbride & Payson 3092* (UCal, Ry, M, G, Pom, CAS); moist, protected slope, Lemhi Mountains, near Patterson, Lemhi Co., alt. 6400 ft., July 13, 1916, *Macbride & Payson 3191* (Ry, G, M); shady rock slides in canyon, Challis Creek, Custer Co., alt. 6000 ft., July 19, 1916, *Macbride & Payson 3335* (G, M, Ry); near Pocatello, May 17, 1893, *Palmer 34* (US); open hillside, Salmon, Lemhi Co., alt. 5000 ft., June 27, 1920, *Payson & Payson 1797* (G, M, Ry); Juniper Hills 10 miles west of St. Anthony, May 3, 1919, *Quayle 15* (Clokey, NY, Ry, US); hills and plains, Pocatello, May 17, 1909, *Slaughter 9* (Ry); damp northern slopes, Pocatello, coll. of 1921, *Soth P–7* (Ry); Shoshone Falls, Jerome Co., May 27, 1899, *Trelease 4805* (M); Sawtooth National Forest, coll. of 1910, *Woods 8a, 14a, 15* (Ry); Sawtooth National Forest, Hailey, coll. of 1910, *Woods 354* (Ry).

UTAH: southwest exposure, Brush Canyon, Wellsville Mountains, Cache Co., alt. 7650 ft., May 10, 1932, *Burke 3117* (U); above cottonwood grove in cliffs, west exposure, Wellsville Mountains, Box Elder Co., alt. 5200 ft., May 4, 1932, *Burke 3118* (U); south exposure, Brush Canyon, Wellsville Mountains, Cache Co., alt. 5650 ft., May 10, 1932, *Burke 3120* (G, U); north exposure, Greene Canyon, Cache Co., alt. 5150 ft., May 12, 1932, *Burke 3721* (W, U, G, Pom); west exposure, Logan Canyon, Cache Co., alt. 5400 ft., May 18, 1932, *Burke 3725* (G, U); Wasatch, May 10, 1874, *Cleburne* (N); red sandstone ridge east of Ft. Douglas, alt. 5500 ft., June 6, 1896, *Cleburne* (N); Wasatch, May 10, 1874, *Cleburne 24* (N); Red Butte, April 24, 1908, *Clemens* (F, G, ANS); Red Butte, Salt Lake City and vicinity, April 27, 1908, *Clemens* (G); Red Butte, Salt Lake City and vicinity, May 6, 1909, *Clemens* (M, F, ANS); alpine meadow, Rosevere, Box Elder Co., alt. 10,000 ft., June 4, 1928, *Cottam 2847* (F); moist places, top of mesa, Rosevere, Box Elder Co., alt. 10,000 ft., June 4, 1928, *Cottam 2908* (F); Sheba Mine, Tooele Co., alt. 9500 ft., June 16, 1928, *Cottam 3176* (F); mountains near Ogden, coll. of 1872, *Coulter* (US); ridge of Red Butte, Salt Lake Co., April 22, 1905, *Garrett 1074* (G); shaded, rocky soil near stream, intervale of Canyon, Cache Co., alt. 4700 ft., May 6, 1932, *Gerber 3720* (U); Ft. Douglas, May 7, 1881, *Jones* (Pom, Ry, AM, Ariz, US); Ft. Douglas, April 28, 1890, *Jones* (Pom, M, UCal, US); Ft. Douglas, April 30, 1890, *Jones* (F, CAS, G, NY, Ry, US, UCal); Mt. Ibapah, June 20, 1891, *Jones* (Pom); Provo Canyon, Utah Co., alt. 5500 ft., June 8, 1896, *Jones* (US, U, M, G); Mt. Ibapah, July 17, 1903, *Jones* (Pom); Ft. Douglas, May 18, 1909, *Jones* (F, US, G); Mammoth, alt. 7000 ft., May 10, 1910, *Jones* (Pom); Ft. Douglas, alt. 6000 ft., May 16, 1911, *Jones* (UCal, Pom); Mammoth, alt. 5500 ft., May 27, 1911, *Jones* (UCal, Pom); Lake Point, alt. 4700 ft., May 29, 1880, *Jones 2038* (F, US, U, CAS, Pom); Ft. Douglas, alt. 6000 ft., May 7, 1881, *Jones 2148* (F); City Creek Canyon, April 21, 1884, *Leonard* (UCal); under sage, Providence Canyon, Cache Co., alt. 5000 ft., May 15, 1932, *Maguire 3719* (U, G, UCal); under brush up Logan Canyon, south of Boy Scout Camp, Cache Co., alt. 6000 ft., May 14, 1932, *Maguire 3722* (U, G, W, M, UCal, Pom); in cliffs along stream, Logan Canyon, Cache Co., alt. 6000 ft., May 29, 1932, *Maguire 3724* (U, G); shade, Mt. Mahogany, Granite Canyon, Deep Creek Mountains, Juab Co., alt. 7800 ft., June 20, 1933, *Maguire & Becraft 2784* (Pom, G, U); sagebrush, Granite Canyon, Deep Creek Mountains, Juab Co., June 20, 1933, *Maguire & Becraft 2785* (U); in crevass on cliff, south exposure, Cottonwood Canyon, Box Elder Co., alt. 6000 ft., April 22, 1932, *Maguire, Burke & Gerber 3119* (U); under sagebrush, 2 miles south, Tony Grove Ranger Station, Logan Canyon, Cache Co., May 27, 1932, *Maguire & Maguire 3723* (UCal, U, G); exposed rocky slopes, 2 miles south of Tony Grove, Logan, Cache Co., alt. 6200 ft., April 29, 1934, *Maguire & Maguire 13103* (G, U); hillside, sun exposure, 1 mile above Board of Trade Camp, Logan Canyon, Cache Co., May 28, 1933, *Muenscher & Maguire 2436* (U, M, Pom); under brush 1 mile up Logan Canyon, Cache Co., alt. 4800 ft., May 28, 1933, *Muenscher & Maguire 2437* (U, G); "above the Forks," Logan Canyon, Cache Co., May 10, 1909, *Smith 1571* (F, Ry, U); Spring Hollow, Logan Canyon, Cache Co., May 28, 1910, *Smith 2160* (U, NY, G TYPE *M. praecox);* Wasatch Mountains, alt. 5500 ft., May, 1869, *Watson 843* (US); rocky brush-covered hillside, Spring Hollow about 5 miles up Logan Canyon, east of Logan, Cache Co., May 27, 1935, *Williams & Williams 2150* (M, W); among sagebrush near summit of Logan Canyon Pass, Cache Co., alt. 8000 ft., May 28, 1935, *Williams & Williams 2151* W, M); Logan Canyon, Cache Co., April 29, 1934, *Williams 21* (W).

NEVADA: sage plains, near head of Thousand Creek, west edge of Humboldt Co., June 6, 1933, *Applegate 8328* (G); Victory Highway, Emigrant Pass, Eureka Co., June 10, 1933, *Eastwood & Howell 209 in part* (W, CAS, G); Victory Highway, Emigrant Pass, Eureka Co., June 10, 1933, *Eastwood & Howell 223* (CAS); Victory Highway, between Elko and Wells, June 11, 1933, *Eastwood & Howell 299* (CAS); Fish Lake, above Marmol Station, alt. 5500 ft., April 30, 1910, *Heller 10003* (F, ANS); Ruby Mountains, south side of Star Canyon near Deeth, alt. 8500 ft., July 8, 1912, *Heller 10546* (F, G, CAS); Palisade, June 14, 1882, *Jones* (Pom); Austin, June 16, 1882, *Jones* (Pom); Star Peak, alt. 8000 ft., July 30, 1901, *Jones* (G, Pom); Hunter Creek, Washoe Co., May 17, 1907, *Kennedy 1661* (Cl, UCal, Ariz, M, AM); Hunter Creek Canyon, 5 miles west of Reno, May 16, 1903, *Kennedy & True 711* (Ry TYPE *M. nevadensis,* UCal); Warm Springs, White Pine Co., May, 1918, *King* (CAS); slopes above snow banks, Jarbidge, alt. 8000 ft., July 6, 1912, *Nelson & Macbride 1938 in part* (G, Ry); shaded cliffs, Jarbidge, July 9, 1912, *Nelson & Macbride 1995 in part* (Ry TYPE *M. Nelsonii,* G); Trinity Mountains, alt. 6500 ft., May, 1865, *Watson 840* (US, G); west Humboldt Mountains, alt. 7000 ft., June, 1865, *Watson 840* (G).

WASHINGTON: near First Creek, near southeast end of Lake Chelan, Chelan Co., May 5, 1935, *Fiker 1652* (P); Grandalles, April 20–22, 1895, *Gorman* (US); ridge, Klickitat, May 12, 1880, *Howell* (P); high hills, eastern Washington, May, 1880, *Howell* (US); north side of high hills near the Columbia River, Klickitat Co., April 1882, *Howell* (UCal); Ahtanum Ridge, Yakima Co., April 15, 1923, *Nelson 1213* (Ry); loose, rocky soil near Mabton, April 6, 1934, *Pickett, McMurray & Dillon 1456* (P); upper Nacher River, May 6, 1923, *Streeter 1449* (Ry); wet bank 10 miles north of Entiat, sagebrush slopes, April 18, *Thompson 5981* (G, M); among sagebrush slopes near Vantage, May 11, 1935, *Thompson 11461* (G); Ellensburg, April 18, 1897, *Whited* (P); dry hillside, near Dutch John's, near Wenatchee, April 23, 1899, *Whited 1034* (P, US).

OREGON: dry open hillside and along small streams, foothills east of Lakeview, Lake Co., May 29, 1902, *Applegate 3070, 3071* (G); in sagebrush near snow, side canyon of Wildhorse Creek, east wall of Steens Mountains, Harney Co., alt. 7000 ft., June 22, 1929, *Applegate 5671* (G, F); among sagebrush and mountain mahogany, edge of snow drifts, summit of Steens Mountains, at south base of highest ridge, alt. 7000 ft., May 5, 1922, *Applegate 5675* (G, F, UCal); dry yellow pine woods, Ochoco Creek near Ochoco Ranger Station, Crook Co., June 9, 1930, *Applegate 6181* (G); yellow pine woods, head of Deep Creek, eastern base of Crane Mountain, Warner Mountains, Lake Co., July 6, 1932, *Applegate 7444* (G); North Fork Sprague River, Gearhart Mountain region, Lake Co., July 21, 1932, *Applegate 7928* (G); Quartz Valley, Lake Co., July, 1893, *Austin* (UCal); near mouth of Burnt River Canyon, April 13, 1884, *Cleburne* (N); northern slope of Castle Mountain, Malheur Co., June 15, 1897, *Cusick 1629 in part* (UCal, Cl, US, P, M, G); dry mountain sides of Juniper Mountain, Malheur Co., May 7, 1900, *Cusick*

2376 (US, P, Cl, M, G, UCal, F, Ry, Pom); Bullard Canyon, Lakeview, Lake Co., alt. 1540 m., June 12, 1911, *Eggleston 6926* (US); edge of snow bank, summit of Crane Creek Mountain, Lake Co., alt. 8400 ft., June 17, 1919, *Ferris & Duthie 252* (Ry); between Merrill and Cottonwood, June, 1901, *Furlong, Greeley, Wilson & Alexander* (UCal); near John Day, Grant Co., May 10, 1928, *Gale 145 in part* (M); Hereford Valley, Baker Co., May 10, 1928, *Gale 177* (M, ANS, Kew); 40 miles south of Arlington, Gilliam Co., May 10, 1928, *Gale 180* (M, US); along Mill Creek, in moist meadows, Burns-Izee Road, Harney Co., May 15, 1927, *Henderson 8313* (CAS); high hills, eastern Oregon, May, 1880, *Howell* (F); on high hills, near Goldendale, April, 1878 (April 20, 1882), *Howell* (Ore TYPE *M. nutans);* Camp Harney, May 26, 1885, *Howell* (US, UCal, P, F); rocks and dirt, east flank of Steen Mountains, above Alvard Ranch, Harney Co., alt. 6000 ft., June 8, 1927, *Leach 8317* (CAS); Mathew Divide, Owyhee, alt. 1520 m., May 30, 1896, *Leiberg 2166* (F, UCal, Pom, Clokey, G, US); dry top of Steen Mountains above Alberson, alt. 2800 m., July 5, 1925, *Peck 14256* (Willm); damp ground, Forest Camp on Dairy Creek, 35 miles northwest of Lakeview, July 1, 1927, *Peck 15403* (Willm, M).

CALIFORNIA: near Emigrant Springs, lava beds, June, 1894, *Austin* (ANS, UCal, ND TYPE *M. symphytoides*, NY); Goose Lake Valley, June, 1898, *Austin & Bruce 2260 in part* (UCal); wet rich soil, in tamarack swamp, Modoc Co., Aug. 5, 1893, *Baker* (UCal); near Lassen's Peak, Sept., *Lemmon* (UCal); near Ft. Bidwell, April–May, 1903, *Manning 83* (UCal).

22b. Mertensia oblongifolia var. **amoena** (A. Nels.), comb. nov.

M. amoena A. Nels. in Bot. Gaz. **30**: 195. 1900.

M. Cusickii Piper in Bull. Torr. Bot. Club **29**: 643. 1902.

M. pubescens Piper in Contr. U. S. Nat. Herb. [Fl. Wash.] **11**: 479. 1906, non Willd., nec H. & B., nec Schultes.

M. Bakeri amoena A. Nels. in Coult. & Nels., Man. Ry. Mt. Bot. 422. 1909.

M. foliosa var. *pubescens* Macbr. in Contr. Gray Herb. N. S. No. 48: 19. 1916.

M. oblongifolia var. *nimbata* Macbr. in Contr. Gray Herb. N. S. No. 53: 18. 1918.

M. Cooperae Peck in Torreya **32**: 151. 1932.

M. foliosa var. *amoena* Johnston in Contr. Arnold Arb. No. 3: 85. 1932.

M. foliosa var. *amoena* f. *Cusickii* Johnston, *l. c.*

Similar to the species, often more robust; leaves more or less densely pubescent on both surfaces.

Distribution: sporadic with the preceding variety and the species; most abundant in western Montana and adjacent Wyoming and Idaho.

MONTANA: Pleasant Valley, June 25–30, 1871, *Allen in part* (US); foothill thickets, Bozeman, May 23, 1899, *Blankinship in part* (M); upland plains, Bozeman, May 4, 1905, *Blankinship 374a in part* (F); upland plains, Bozeman, alt. 5000 ft., May 5–8, 1906, *Blankinship 374b in part* (Pom, N, UCal); Bozeman, May 18, 1893, *Gottschalch* (G TYPE *M. oblongifolia* var. *nimbata*); Bozeman, May 13, 1905, *Jones in part* (UCal); Deer Lodge, June, 1890, *Kelsey* (F); Helena, May, 1889, *Kelsey 62 in part* (CAS); Bear Canyon, May 25, 1900, *Moore in part* (UCal); Bridger Canyon, May 15, 1901, *Moore in part* (UCal); Monida, June 16, 1899, *Nelson 5413a in part* (M, Ry, US); among sagebrush on a moist slope, Monida, Madison Co., June 16, 1899, *Nelson & Nelson 5413 in part* (M, Ry TYPE *M. amoena*, P, G, N, Pom, K, AM, Cl); foothills, Deer Lodge, April 27, 1888, *Stapleton 53 in part* (UM); near Mullen Tunnel, April 28, 1889, *Suksdorf* (P).

WYOMING: above junction of Mt. Washburn, Camp Roosevelt, July 1, 1924, *Conard 1289* (Ry); Mammoth Hot Springs, alt. 5800 ft., April, 1889, *Dewart* (M, G, Cl, K, UCal, N); on open grassy slopes, Glen Creek, Yellowstone National Park, June 29, 1899, *Nelson & Nelson 5556* (Ry).

IDAHO: in coniferous forest, Sawtooth Mountains, Payette River, Boise Co., June 18, 1930, *Applegate 6303 in part* (G); headwaters of the Middle Fork of Salmon River, Bear Valley, Sawtooth Mountains region, Custer Co., June 18, 1930, *Applegate 6312* (G); near Reservoir, Modoc Creek, Targhee Forest, Fremont Co., alt. 2400 m., June 4, 1928, *Eggleston 22017* (G); clumps, moist open slopes, Dry Buck, Boise Co., alt. 5500 ft., May 10, 1911, *Macbride 856* (UCal, F, Ry, US, Pom, M, G); deep, loamy soils on hillsides, Lost River Mountains, Blaine Co., alt. 8000 ft., July 10, 1916, *Macbride & Payson 3143 in part* (CAS, Ry, Pom, UCal); dry exposed hillside, Cape Horn, Custer Co., July 30, 1916, *Macbride & Payson 3522* (Ry); open hillsides, Josephus Lakes, Custer Co., alt. 7500 ft., Aug. 3, 1916, *Macbride & Payson 3557* (CAS, Pom, US, G, M, Ry); open hillside, Josephus Lakes, Custer Co., alt. 7500 ft., Aug. 3, 1916, *Macbride & Payson 3846* (G); Owyhee Mountains, July, 1892, *Mulford in part* (N); Payette Forest Reserve, coll. of 1912, *Nelson D–9* (Ry); moist north slope, Squaw Creek, Sweetwater Co., alt. 3500 ft., May 9, 1911, *Nelson & Macbride 837* (Ry); Beaver Canyon, June 27, 1895, *Shear 4407* (US); Beaver Canyon, July 13, 1880, *Watson 249* (G).

UTAH: among sagebrush, north slope of a small canyon about 3 miles east of Laketown, Rich Co., May 28, 1935, *Williams & Williams 2152* (W, ND, P, O, NY, G, Cl, M).

NEVADA: Little Lakes Canyon, West Stampede, Elko Co., June 13, 1902, *Kennedy 512* (Ry).

WASHINGTON: Browns Mountain, 5 miles southeast of Spokane, Spokane Co., April 7, 1925, *Davison* (P); top of Browns Mountain, 5 miles southeast of Spokane, Spokane Co., April 11, 1925, *Davison* (P); 6 miles west of Ephrata, Grant Co., April 8, 1926, *Jones 4126* (G); basalt scab land, east of Pearl, Douglas Co., May 20, 1928, *St. John, Eggleston, Beals & Warren 9387* (P); hillside near Lanz, Adams Co., April 10, 1924, *St. John, Pickett, Cary & Warren 3459* (M, G, P); Waterville, Douglas Co., April 23, 1900, *Whited 1214* (P, US TYPE *M. pubescens).*

OREGON: side canyon of Wildhorse Creek, east slope of Steens Mountains, alt. 7000 ft., May 22, 1929, *Applegate 5668* (G); Riley, Harney Co., June, 1922, *Cooper* (Willm TYPE *M. Cooperae);* Warner Range, Lake Co., alt. 1800 m., July 25, 1896, *Coville & Leiberg 25* (US); dry soil, Steens Mountains, alt. 7000 ft., June 18, 1901, *Cusick 2582* (UCal, US TYPE *M. Cusickii*, Cl, Pom, F, M, G, Ry, P); moist, rich, sunny banks of Silver Creek, near commencement of yellow pine, Harney Co., May 29, 1927, *Henderson 8315* (UCal, CAS); moist meadows, Spring Creek, road, Burns-Izee, Harney Co., May 15, 1927, *Henderson 8316* (CAS, UCal); top of Steens Mountains, divide near Wildhorse Creek and Huffman's Ranch, Harney Co., June 10, 1927, *Henderson 8318* (CAS); Owyhee-Malburn Divide, alt. 1300 m., May 31, 1896, *Leiberg 2178* (US, Pom, F, UCal, G, Kew); moist ground, Silvies River, Harney Co., June 26, 1912, *Peck 2914* (Willm); damp ground, upper Myrtle Creek, Harney Co., July 14, 1912, *Peck 2920* (Willm); moist ground, Emigrant Creek, Harney Co., June 23, 1912, *Peck 3236* (Willm); near the top of Pueblo Mountains, Harney Co., alt. 8000 ft., July 3, 1927, *Rogers 8319* (CAS).

CALIFORNIA: in sagebrush near spring, north slope of Ridwell Mountain, Warner Mountains, July 9, 1932, *Applegate 7615* (G); Lassen Creek, Modoc Co., Aug., 1894, *Austin* (UCal); Lake City Canyon, June, 1898, *Bruce A* (UCal); Parker Creek, Warner Mountains, Modoc Co., alt. 6000–7000 ft., June 13, 1919, *Ferris & Duthie 125* (Ry); Pine Creek Basin, Warner Mountains, Modoc Co., alt. 7600 ft., July 7, 1929, *Payne 57* (CAS).

The typical phase of *M. oblongifolia* occurs in western Montana, adjacent Wyoming, northern Idaho, and eastern Washington, and usually has larger corollas than those found in other localities. Elsewhere the occurrence is usually sporadic with the variety *nevadensis* which is probably the basic phase of this group. As can be seen above in the synonymy this species has been variously treated. Piper's *M. nutans* subsp. *subcalva* is identical with the typical phase but based on young specimens. Macbride and Payson's *M. Bakeri* var. *subglabra* is a robust phase, which shows all intergradations to the typical phase.

Mertensia oblongifolia var. *nevadensis* is again much described and is an extremely variable plant. The type would be difficult to distinguish from the species except that the leaves are completely glabrous or nearly so. The known phases are numerous; part of them are probably due to the time of collection of specimens. *Mertensia nutans* and *M. coronata* are nearly typical; *M. stenoloba, M. tubiflora,* and *M. intermedia* are robust phases; *M. symphytoides* is a tall phase; *M. nevadensis* is a small phase but quite typical; *M. praecox* is an extremely robust, broad-leaved phase, which in early growth stages is indistinguishable from var. *nevadensis; M. Nelsonii* is a fairly robust, probably shade, phase.

Mertensia oblongifolia var. *amoena* is the phase in which the leaves are pubescent on both sides, a character in which extremes occur. *Mertensia Cusickii* is an extreme pubescent and robust phase, and *M. Cooperae* is similar to it but smaller; *M. pubescens* is slightly more pubescent than the type of the variety; *M. eplicata* is a phase similar to *M. Cusickii* but slightly less pubescent; *M. oblongifolia* var. *nimbata* is slightly less pubescent than typical and with the pubescence mostly appressed.

The rather numerous names which have been applied to this small but widely distributed group give an idea of the variations found within it.

Phases of the three entities here considered to comprise the group have been studied in the field. It is felt that they represent only three phases of one entity which is widely distributed and variable, some phases being much more vigorous than others. Apparently any of the three entities may be expected at any part of the range of the group even though they are not now known. Material of *M. foliosa* and of nearly typical *M. oblongifolia* was known from southwestern Wyoming. It was thought that var. *amoena* should be found in that general region even though it was known only from Yellowstone Park as nearest locality. Consequently a large number of "patches" in that region, where it is extremely common, were carefully gone over and it was found not a great distance away in adjacent Utah, queerly enough in a patch which contained only that variety. That the species and one or even both varieties occur together seems not to be unusual. The type collection of *M. amoena* contains all three varieties; the type specimen itself is fortunately all the very pubescent plant. *Mertensia oblongifolia* and the var. *nevadensis* occur together quite commonly in northwestern Wyoming, and a search through any large patch will almost always disclose them both.

These plants change their aspect considerably from the time they first come in flower until a mature flowering stage is reached. To this characteristic may be attributed part of the excess describing of plants belonging to the group.

Although this group is fairly distinct, attention should be called to the fact that they closely simulate, in some phases, *M. viridis* and its var. *dilatata*.

It is interesting to note that the treatment accorded this group by Johnston, Contr. Arnold Arb. No. 3: 84–85. 1932, is similar to the one here presented. The main difference is that *M. foliosa* var. *subcalva* is here considered to be the same as *M. oblongifolia,* and that the other two names he used, *M. foliosa* and *M. foliosa* var. *amoena,* are given varietal rank under *M. oblongifolia,* the former as var. *nevadensis* for bibliographical reasons. Both treatments are decidedly at variance with the one presented by Macbride in Contr. Gray Herb. N. S. No. 48. 1916.

It is unfortunate that Macbride has used *M. nevadensis* in a varietal category. Except for that, the more appropriate and older name *M. foliosa* would be taken up as a variety of *M. oblongifolia,* but evidently *nevadensis* must be perpetuated according to the international rules. The types of *M. foliosa* and *M. nevadensis* are as much alike as the proverbial peas and are at almost the same stage of anthesis.

23. **Mertensia oreophila,** sp. nov.[1]

Stems procumbent or ascending, 4–15 cm. tall, 1–several from each rootstalk; basal leaves orbicular to oblong-ovate, obtuse, 2–5 cm. long, 1–2 cm. broad, glabrous or the upper surface pustulate, subcoriaceous, obscurely ciliate; cauline leaves elliptic-oblong to broadly ovate, obtuse, 1–5 cm. long, 0.7–2.5 cm. broad, glabrous or the upper surface pustulate, subcoriaceous; inflorescence terminal, crowded, not elongated in fruit; pedicels 1–6 mm. long, glabrous; calyx 3–6 mm. long, the lobes lanceolate-oblong to oblong-ovate, subacute, 2–4 mm. long, glabrous, obscurely ciliate, slightly accrescent; corolla-tube 5–10 mm. long, glabrous within; corolla-limb moderately expanded, 3–6 mm. long; anthers 1.2–2 mm. long; filaments 1–

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[1] **Mertensia oreophila,** sp. nov., caulibus procumbentibus vel ascendentibus, 4–15 cm. altis, 1-plura ex eadam radice; foliis basalibus orbicularibus vel oblongo-ovatis, obtusis, 2–5 cm. longis, 1–2 cm. latis, glabris vel supra pustulosis, subcoriaceis, obscure ciliatis; foliis caulinis elliptico-oblongis vel late ovatis, obtusis, 1–5 cm. longis, 0.7–2.5 cm. latis, glabris vel supra pustulosis, subcoriaceis; inflorescentia conferta, maturitate non elongata; pedicellis 1–6 mm. longis, glabris; calyce 3–6 mm. longo, lobis lanceolato-oblongis vel oblongo-ovatis, subacutis, 2–4 mm. longis, glabris, obscure ciliatis, paulo accrescentibus; corollae tubo 5–10 mm. longo, infra glabro; corollae limbo 3–6 mm. longo; antheris 1.2–2 mm. longis; filamentis 1–2.5 mm. longis, latioribus quam antheris; fornicibus conspicuis, glabris; nucellis ca. 3 mm. longis, rugosis.

2.5 mm. long, broader than the anthers; fornices conspicuous, glabrous; style reaching or surpassing the anthers; nutlets about 3 mm. long, rugose.

Distribution: Big Horn Mountains, Wyoming.

WYOMING: Big Horn Mountains, May 8, 1896, *Moore* (Ry); moist meadows near Powder River Pass, south end of the Big Horn Mountains, alt. 9600 ft., July 4, 1935, *Ownbey 811* (Ry, W); wind-swept ridges near Little Baldy, Big Horn Mountains, alt. 9500 ft., July 5, 1935, *Ownbey 841* (Ry, W); protected hillsides near Buffalo, Johnson Co., April 18, 1934, *Rollins 404* (W); among sagebrush, upper Ten Sleep Canyon, Big Horn Mountains, Washakie Co., alt. 9000 ft., July 3, 1935, *Williams 2325* (M, W); rocky open ridges near head of North Fork of Powder River, Big Horn Mountains, Johnson Co., alt. 9000 ft., July 4, 1935, *Williams 2331* (M TYPE, P, ND, G, NY, Cl, Dudley Herb, W); rocky ridges, Little Baldy, Big Horn Mountains, Big Horn Co., alt. 9500 ft., July 5, 1935, *Williams 2360* (M, ND, Cl, P, W); Hurlbut Creek, Sheridan Co., May 4, 1909, *Willits 6* (Ry).

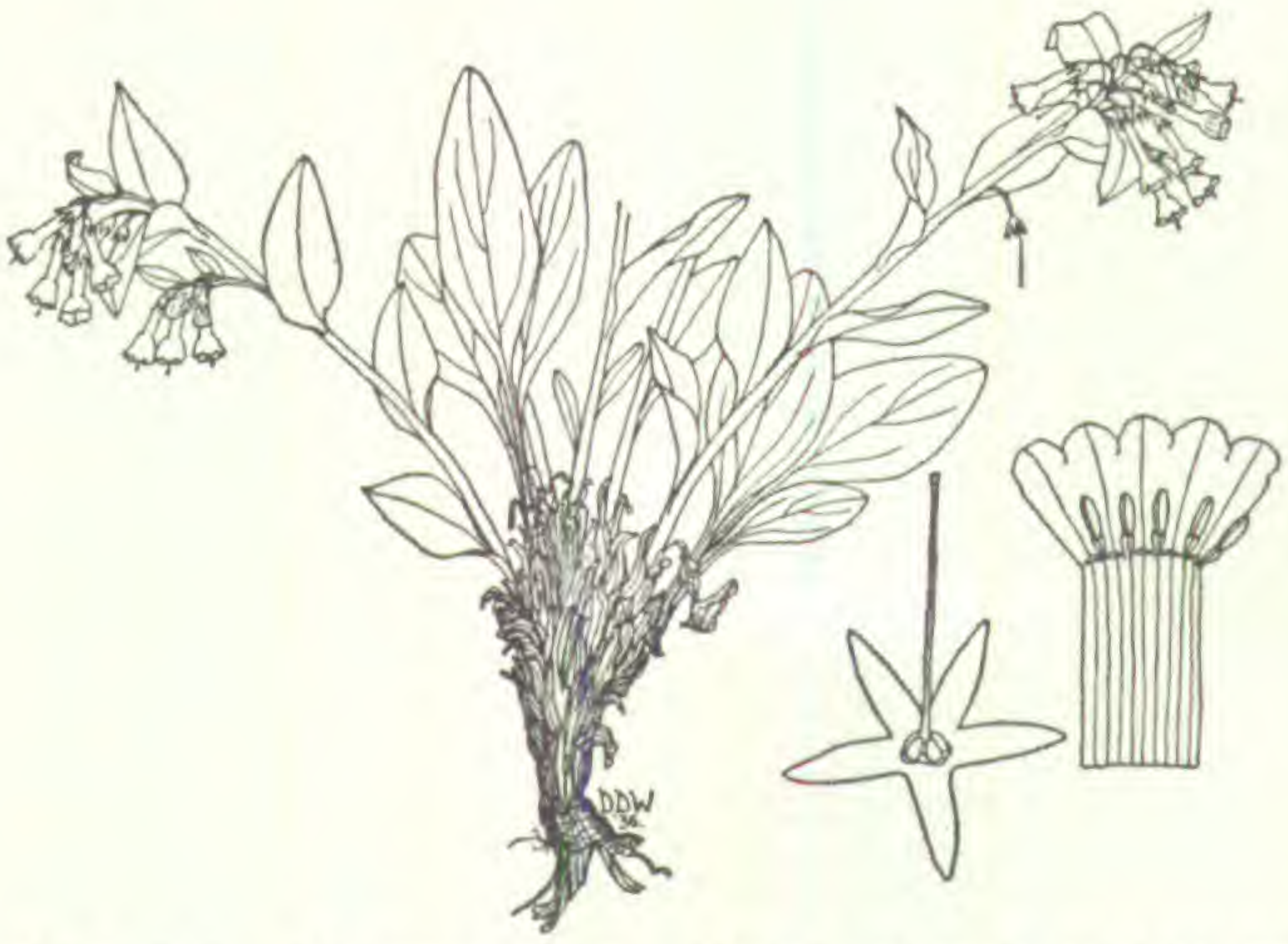

Fig. 15. *M. oreophila.* Habit sketch × ⅓; enlarged flower × 1⅔.

Mertensia oreophila, in the field, has much of the aspect of *M. humilis* as to size and habit of growth. The relationship of this species, however, is to *M. oblongifolia* var. *nevadensis.* From this it is distinct mainly in shape and texture of the leaves, the habit of growth, and facies. Furthermore, *M. oreophila* shows the same characteristic elongation of the corolla as do *M. longiflora* and *M. oblongifolia* and its varieties. The size of the corolla is about doubled from the time it opens until the time that it is ready to fall.

The localized distribution of this species is of interest. The

Big Horn Mountains are isolated by about 100 miles of plains from the nearest mountains of like magnitude. Much of the mountain flora there is similar to that of the mountains to the west, in Wyoming, but some of it is made up of species from the mountains of Colorado, not known elsewhere from Wyoming. The present species is probably endemic in those mountains.

24. **Mertensia longiflora** Greene, Pittonia **3**: 261. 1898.
M. pulchella Piper in Contr. U. S. Nat. Herb. [Fl. Wash.] **11**: 478. 1906.
M. pulchella subsp. *glauca* Piper, *l.c.* 479.
M. Horneri Piper, *l.c.* 479.
M. longiflora var. *pulchella* Macbr. in Contr. Gray Herb. N. S. No. 48: 17. 1916.
M. longiflora var. *Horneri* Macbr. *l.c.*

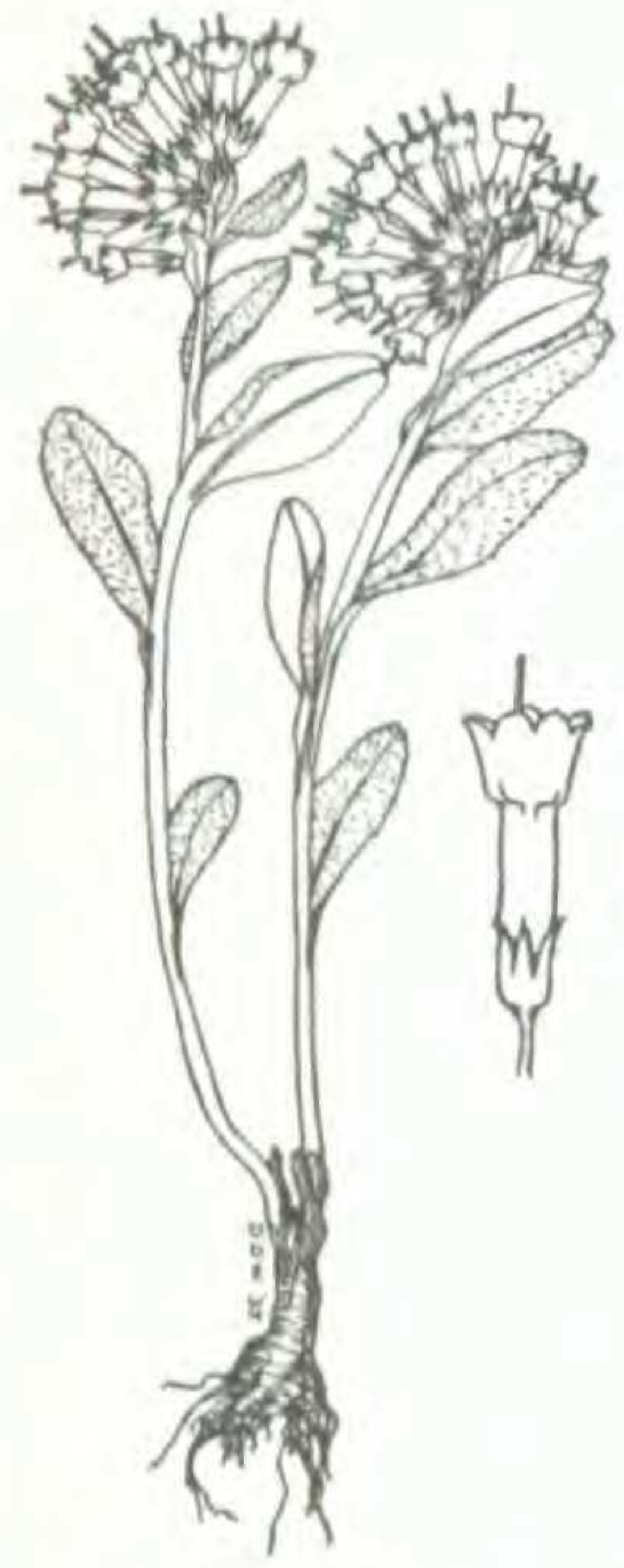

Fig. 16. *M. longiflora.* Habit sketch × 1/3; enlarged flower × 2/3.

Stems erect, 0.6–3.5 dm. tall, one to few from each shallow-seated, short, tuberous root, easily detached; basal leaves rarely from roots producing flowering stems, oval to spatulate, 2–5 cm. long, 1.2–2.5 cm. broad, winged petiole longer or shorter than the blade, or vestigial and often scarious, glabrous to hirsute above, glabrous below; cauline leaves oblong-lanceolate to broadly ovate, 2–8 cm. long, 0.4–4.5 cm. broad, obtuse, mostly less than three times longer than broad, glabrous to hirsute or strigose on the upper surface, glabrous below (very rarely pubescent on the lower surface as well); inflorescence usually congested, short; pedicels glabrous or pubescent, 0.5–6 mm. long; calyx 3–6 mm. long, the lobes lanceolate to linear-lanceolate, acute, 2.5–4.5 mm. long, glabrous, ciliate; corolla-tube 8–15 mm. long, glabrous or with a few hairs confined to the basal portion within; corolla-limb 4–7 mm. long, usually much shorter than the tube, moderately expanded; anthers 1–1.7 mm. long; filaments 1–2 mm. long, about as wide as or wider than the anthers; style about as long as or longer than the corolla;

fornices conspicuous, usually glabrous; nutlets 3–4 mm. long, rugose.

Distribution: western Montana, northern Idaho, southern British Columbia, Washington, and Oregon to northern California, mostly in the low hills or on the prairies.

MONTANA: Monida, June, 19, 1922, *Jones* (Pom); Columbia Falls, May 22, 1893, *Williams* (G, M); Columbia Falls, May 20, 1894, *Williams* (Ry, US, UM).

IDAHO: Paradise Hills, Latah Co., April, 1900, *Abrams 545* (Pom, UCal); coll. of 1874, *Ainslie* (US); south slope, summit of Cedar Peak, Thatuna Hills, Latah Co., alt. 4900 ft., May 18, 1935, *Constance, Clements & Rollins 1066* (W, M); shrubby, rocky hillside, Hope, April 7, 1914, *Dunkle* (UIdaho); along the Clearwater River, east of Lewiston, on Nez Perce Reservation, April 23–May 18, 1892, *Heller 75* (ANS); about Lake Waha, Nez Perce Co., alt. 2000–3500 ft., June 2, 1896, *Heller & Heller* (US); moist hills, Juliaetta, April 21, 1894, *Henderson* (Cl); warm, moist, open or wooded hills, about Moscow, April 21, 1894, *Henderson* (Ry); common on open hills or in light pine woods, April 21, 1894, *Henderson* (US); steep north hillside, Lewiston, March 3, 1900, *Hunter 11* (P); Middle Valley, alt. 2300 ft., April 20, 1900, *Jones* (Pom); mountains, Kootenai Co., July, 1890, *Leiberg* (F, M); moist hillsides, Kootenai Co., May, 1892, *Leiberg* (F); hills near Fort Coville, coll. of 1861, *Lyall* (G); Albion, coll. of 1893, *Lyles* (UM); Porphyry Peak, Bitter Root Mountains, alt. 6000 ft., June 28, *Marcy* (G); loam, Bear Basin, Idaho Forest, alt. 5500 ft., coll. of 1915, *Maris 45* (N); loose sandy loam, Payette Forest, alt. 5000 ft., May 31, 1911, *Moore 96* (Ry); Wallace, June, 1909, *O'Neal 8* (Ry); dry gravelly bluff along Lewiston grade, Nez Perce Co., alt. 1400 ft., April 6, 1922, *Parker 327* (P); wooded slopes, Mt. Baldy, Salmon, Lemhi Co., alt. 8000 ft., July 1, 1920, *Payson & Payson 1863* (G, Ry, M); dry slopes in yellow pine, Priest River Experiment Station, Kaniksu National Forest, May 26, 1913, *E. C. R. & J. A. L. 119* (US); Latah Co., coll. of 1900, *Ried 4* (P); dry soil, Bitter Root Mountains, June, 1887, *Sandberg 172* (F); frequent on slopes, valley of Clearwater River, Nez Perce Co., April 28, 1892, *Sandberg, MacDougal & Heller 75* (Pom, CAS, US, P photograph, G, US TYPE *M, pulchella); on the lower Clearwater River, Nez Perce Co., April 30, 1892, *Sandberg, MacDougal & Heller 75a* (US); Clearwater, *Spalding* (G); hillside, Albany Falls of Pend Oreille River, Kootenai Co., May 12, 1923, *Sprague 707* (P); Carlin Bay, Lake Coeur d'Alene, Kootenai Co., April 25, 1926, *St. John, Gessell, Jones, Ridout & Woods 4240* (P); woods, Coeur d'Alene, Kootenai Co., April 25, 1926, *St. John, Gessell, Jones, Ridout & Woods 4269* (P); moist hillsides, Chatcolet, Benewah Co., May 12, 1928, *Warren 883* (P); Grangeville, coll. of 1887, *Weeks* (F); Hailey, Sawtooth National Forest, coll. of 1910, *Woods 314* (Ry).

BRITISH COLUMBIA: open, Cranbrook, April 29, 1908, *Anderson* (P); open land, Grand Forks, April 13, 1906, *Anderson 56* (P); Chare, Yale and Caribou Districts, April 20, 1919, *Anderson* (P); Waneta, Kootenay District, April 6, 1898, *Jamieson 196* (P); Trail near International Boundary between Kettle and Columbia Rivers, May 26, 1902, *Macoun 66567* (P, CAS, Pom, F, G); Midway, April 16, 1905, *Macoun 76738* (Cl, F).

WASHINGTON: dry treeless plains, Douglas, Douglas Co., April 25, 1931, *Applegate 6691* (F, G); hillside 1 mile south of Albion, Whitman Co., alt. 2250 ft., May

11, 1928, *Beals* (P); Rattlesnake Hills, Benton Co., coll. of 1926, *Bennett* (P); on moist hillside, Almota Canyon, alt. 1500 ft., April 5, 1930, *Clarke* (P); Pullman, May 14, 1896, *Climer* (P); open pine woods, foothills of Blue Mountains, 10 miles south of Pomeroy, Garfield Co., May 2, 1921, *Courtney* (P); Pullman, June, 1896, *Elmer* (Pom); on shady stream banks, Pullman, June 12, 1896, *Elmer 31* (Pom); on shady stream banks, Pullman, May 20, 1896, *Elmer 158* (Ry); Pullman, Whitman Co., June, 1899, *Elmer 1584* (M); (probably near Omak), Okanogan Co., April, 1931, *Fiker 40* (P); in thicket along Chiliwist Creek, near Olema, Okanogan Co., April 24, 1932, *Fiker 584* (P); on moist hillside, Pullman, Whitman Co., May 10, 1928, *Fontanilla 947* (ANS); Republic, Sept., 1912, *Foster* (M); Columbia River Valley, Stevens Co., April, 1911, *Gabby 8* (P); wooded slopes near Vantage, April 20, 1931, *Granstand* (M); Walla Walla, Walla Walla Co., May 15, 1911, *Hill* (P); Blue Mountains, Walla Walla Co., June 10, 1911, *Hill* (P); grassy knolls, Waitsburg, April 7 and 14, 1906, *Horner* (US); grassy knolls, Waitsburg, April 21 and 28, 1906, *Horner* (US); Waitsburg, April 3, 1897, *Horner 366* (US TYPE *M. Horneri)*; hilltops, Waitsburg, Walla Walla Co., April 3, 1897, *Horner R155B366* (G); high hills, eastern Washington, May, 1880, *Howell* (F); moist hillsides, Almota Canyon, Whitman Co., March 28, 1926, *Jones 251* (P); rocky ground, on top of Steamboat Rock, Douglas Co., April 12, 1930, *Jones 2826* (G); rocky hillside, Manashtash Ridge, Kittitas Co., April 14, 1935, *Jones 6332* (UCal); wet soil, Newman Lake, Spokane Co., alt. 2000 ft., April 21, 1926, *LaMotte 4* (ANS); hills near Spokane, coll. of 1861, *Lyall* (G); Pullman, April 22, 1906, *Miner* (P); rocky hillsides and moist places, Pullman, April 22, 1901, *Miner 86* (P); in field near edge of canyon, Snake River, April 26, 1913, *Muenscher 351* (Cl); moist hillsides, Almota, April 7, 1894, *Piper* (P); on hillsides, Pullman, April 25, 1894, *Piper* (UCal); in moist ground, Pullman, April 25, 1894, *Piper 1875* (P); at the top of the canyon, 1 mile east of the Grand Coulee Dam, Grant Co., April 21, 1935, *Rollins 861* (W); Medical Lake, alt. 1000–2000 ft., May, 1893, *Sandberg & Leiberg* (Pom, UCal, ND TYPE, M, ANS); Hangman Creek, Spokane Co., alt. 1910 ft., May 20, 1893, *Sandberg & Leiberg 48* (M, UCal, CAS, G, US, P, ANS); Pullman, April 27, 1897, *Sheldon* (P); Pullman, April 16, 1923, *Spiegelberg* (P); moist hillside, Sacheen Lake, Pend Oreille Co., May 9, 1923, *Spiegelberg 527* (P); south slope, in low shrubs, Kamiak Butte, Whitman Co., May 6, 1922, *Sprague* (Pom); rich warm soil, Sacheen Lake, Pend Oreille Co., May 9, 1923, *Sprague 706* (P); above Shell-rock Point, near Oueak, alt. 1200 ft., April, 1917, *Steward 36* (UM); north bank of Palouse River, below Colfax, Whitman Co., April 29, 1922, *St. John 3038* (P); rocky south slope, Kamiak Butte, Whitman Co., April 17, 1921, *St. John 6065* (P, M); rocky soil, Ewan, Whitman Co., April 10, 1924, *St. John, Cary, Pickett & Warren 6325* (P); rocky hillsides, Almota Canyon, Whitman Co., April 11, 1923, *St. John & Pickett 6508* (P); grassy draw, south end of Rock Lake, Whitman Co., April 9, 1925, *St. John, Pickett & Warren 6879, 6880* (P); Spangle, April, 1894, *Suksdorf* (P); Waverly, May 16, 1889, *Suksdorf* (P); Liberty Lake, May 2, 1916, *Suksdorf 8560* (P); on the hills south of Spokane Bridge, May 4, 1916, *Suksdorf 8570* (P, UCal, CAS, G, ANS, M); Hangman (Latah) Creek, near Spangle, May 12, 1916, *Suksdorf 8615* (P); open pine slopes 10 miles east of Cle Elum, April 4, 1931, *Thompson 5946* (US, CAS, G, M); rocky slope at northern base of Blewett Pass, April 18, 1931, *Thompson 5996* (M, G); moist slope 2 miles west of Cashmere, April 18, 1931, *Thompson 6004* (US, M, G); open rocky slopes on Lookout Mountain, near Leavenworth, alt. 5000 ft., May 23, 1931, *Thompson 6502* (M, G); Rimrock near Lauderdale Auto Camp, April 23, 1932, *Thompson 8227* (UCal, CAS, M, G); open summit of Tumwater Mountain, alt. 4500 ft., May 12, 1934, *Thompson 10485* (CAS, M, G); Cheney, Spokane Co., coll. of 1890, *Tucker* (G); Spokane, July 5, 1895, *Tucker* (ANS); Spokane Co., April 20, 1913, *Turesson* (Ry); Springdale, Stevens Co., April 19, 1925, *Tuttle* (P); rocky hillside, west of Ephrata, Grant Co., April 5, 1921, *Vercler* (P); Badger Mountain, Douglas Co., May 24, 1900, *Whited* (P); hills west of Wenatchee, March 31, 1899, *Whited 1010* (P, G, US TYPE *M. pulchella* subsp. *glauca).*

OREGON: on Bald Knob, Bear Creek, Wallowa Mountains, alt. 1950 m., June 4, 1907, *Coville 2376* (US); common on open hillsides, Union Co., alt. 3000–4000 ft., coll. of 1880, *Cusick 41* (F, US); stony hillsides, eastern Oregon, April 13, 1898, *Cusick 1830* (UCal, F, P, US, G, Cl, M); very common, basaltic soil, moist open hills, eastern Oregon, alt. 1130 m., April 12, 1907, *Cusick 3151* (UCal, F, P, Ry, US, G); basaltic rocks, steep north slopes where snow drifts deep, eastern Oregon, alt. 1200 m., May 6, 1907, *Cusick 3155* (UCal, F, M, P, US, G, Ry); basaltic soil, steep north slope, in partial shade of trees, eastern Oregon, alt. 1330 m., May 1, 1907, *Cusick 3159* (UCal, F, P, US, G, M, Ry); commonly growing among small rocks, basaltic soil, steep mountain sides of East Eagle Creek, Wallowa Mountains, alt. 2160 m., June 8, 1907, *Cusick 3169* (UCal, F, P, US, G, Ry, M); wet ledges on cliffs, Umatilla River, Blue Mountains, alt. 2000 ft., April 7, 1910, *Cusick 3424* (F, Willm, M, US, P, Ry, G); near North Powder, Union Co., May 10, 1928, *Gale 140a* (Kew); near John Day, Grant Co., May 10, 1928, *Gale 145* (Kew, G); near Dayville, Grant Co., May 10, 1928, *Gale 152* (M, ANS); near Austin, Grant Co., May 10, 1928, *Gale 165* (Kew) and *169* (F, Kew, M); Oregon, *Geyer 316* (G); moist soil, open pine woods, middle altitudes, Blue Mountains, 6 miles from Mt. Vernon, Grant Co., April 27, 1925, *Henderson 5008* (CAS, G, M); open grassy ground, top of Dixie Mountain, Blue Mountains, Grant Co., alt. 8000 ft., June 13, 1925, *Henderson 5216* (G, M, CAS); moist yellow pine woods, summit of Blue Mountains, Burns-Canyon City road, Grant Co., May 26, 1927, *Henderson 8314* (CAS); Blue Mountains, May 21, 1885, *Howell* (F, G, P); Blue Mountains, May 26, 1885, *Howell* (G); abundant on glade areas, Billy Meadows, Wallowa National Forest, March 4, 1908, *Jardine 186* (US); moist bank, Wallowa Falls, Wallowa Co., May 25, 1923, *Sherwood 309* (F, Willm); 3 miles south of La Grande, May 23, 1923, *Sherwood 324* (Willm); sagebrush slopes near Pondosa, April 14, 1935, *Thompson 11329* (G).

CALIFORNIA: hillsides, Modoc Co., alt. 5000 ft., April, May, *Gilman 583* (UCal).

Mertensia longiflora is evidently a close ally of *M. oblongifolia* and its varieties and some incomplete specimens might be confused with them. It seems, however, to be a natural unit and well worthy of distinct designation.

This species also shows a number of variations as to pubescence. The variation is from forms with leaves glabrous, even lacking pustules, to forms with leaves having the upper surface pustulate to short-strigose and from that to rather long-hirsute. The integradation between these phases is complete and as high as six intergrading phases have been found on the same herbarium sheet. Part of the specimens on two sheets seen (*Elmer 31* (Pom) and *Elmer 158* (Ry)) have leaves pubescent on both sides as well as pubescent stems. In view of this complete intergradation, where no line can be drawn between the variation, it is thought best to treat them all as one species. Variation is also to be found in size of corollas. This is to be expected, particularly between young and well-developed plants and to a lesser extent between plants of the same age.

DOUBTFUL AND EXCLUDED SPECIES

Mertensia pilosa (Cham.) G. Don, Gen. Hist. **4**: 320. 1838; A. DC. in DC., Prodr. **10**: 90. 1846 *(Pulmonaria pilosa* Cham. in Linnaea **4**: 449. 1829, at least in greater part). Said to have been from Eschscholz Bay (Alaska). The type not seen nor the species identified.

Mertensia denticulata (Lehm.) G. Don, Gen. Hist. **4**: 319. 1838 *(Lithospermum denticulatum* Lehm., Asperif. pars 2: 294. 1818; *Pulmonaria denticulata* R. & S., Syst. **4**: 746. 1819; *Casselia denticulata* Dumort., Com. Bot. 23. 1822). The type could not be located and the plant has not been identified. Habitat given as "America septentrionali."

Mertensia Drummondii (Lehm.) G. Don, Gen. Hist. **4**: 319. 1838 *(M. sibirica* var. *Drummondii* Gray in Proc. Am. Acad. **10**: 53. 1875; *Lithospermum Drummondii* Lehm., Pug. **2**: 26. 1828). The type has not been located. Locality or collector not given. In Hooker's 'Fl. Bor.-Am.,' to which Lehmann contributed the treatment of this group, the habitat is given as "Arctic Sea-shore." It is possible that Hooker supplied that data.[1] Dr. Gray, in the 'Synoptical Flora' gave the habitat as "Arctic Sea-shore, Richardson." The Richardson specimen bearing that data is a very pubescent phase of *M. paniculata* (Ait.) G. Don.

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[1] There is a specimen in the British Museum of Natural History, London, bearing the collection data (a printed form) "British America. Dr. Richardson 1819-22," which may be the specimen cited by Hooker. The specimen is probably erroneously labeled for it seems to be one of the phases of *M. viridis* known to the author only from Colorado. There is a probable duplicate of this collection in the Herbarium of the New York Botanical Garden.

Mertensia corymbosa (Lehm.) G. Don, Gen. Hist. **4**: 319. 1838 *(Lithospermum corymbosum* Lehm., Pug. **2**: 27. 1828). The type could not be located nor the species identified with certainty. It may possibly be *M. paniculata* (Ait.) G. Don.

Pulmonaria elliptica Raf., New Fl. N. Am. pt. 4: 17. 1836, is probably a synonym of *Hackelia virginiana* (L.) Johnston, according to Johnston.

LIST OF EXSICCATAE[1]

The collector 's numbers are indicated in *italics*, or if the collection is unnumbered, by a dash. The numbers in parentheses are those assigned to the species and varieties in this monograph.

Abbe, E. C. *1247* (1).
Abbott, E. K. — (11).
Abrams, L. R. *804* (4); *9177* (4b); *545* (24).
Abrams, L. R. & A. T. Benson. *10540* (6a).
Adams, Robert. — (12a).
Ainslie, R. S. — (24).
Aiton, Geo. B. — (4).
Albrecht. — (11).
Allen, G. N. — (22a); — (22b).
Allen, O. D. *2, 231* (4b).
Allen, P. *147* (14a); *105* (19).
Allen, T. F. — (12).
Ames, F. *41* (3).
Ames, M. E. — (12c).
Anderson, F. E. *7* (22a).
Anderson, F. W. —, *252, 305, 5855* (22a).
Anderson, J. P. *797, 1112, 1892a* (4); — (12).
Anderson, J. R. —, *56* (24).
Anderson, W. A. *392* (11).
Anderson, W. B. *799* (4); — (24).
Andersson, N. J. — (1).
Andrews, D. M. *26* (14); *32* (14a); *9* (19).
Andrews, R. C. *339* (2).
Anect, Bro. *51, 68* (5); *23* (14d).
Angel, J. B. *33* (1).
Anspach, G. — (1).
Anthony, H. E. *47* (16).
Apgar, A. C. — (11).
Applegate, E. I. *5061, 8751, 8767, 9696* (2); *2578, 4127, 5999* (4b); *6326* (10); *8551* (14a); *8431* (16); *6303* (22); *3070, 3071, 5671, 5675, 6181, 7444, 7928, 8328* (22a); *5668, 6303, 6312, 7615* (22b); *6691* (24).
Archibald, J. M. *A156* (14a).
Arsène, G. *17902, 20756* (5).
Arsène, G. & A. Benedict. *15728, 16129* (5); *16131* (19b).
Arsène, L. *406* (1).
Atkinson, G. F. — (19).
Austin, R. M. —, *91, 276, 442, 1193* (12c); *511* (22); — (22a); — (22b).
Austin, R. M. & Bruce, *2372* (12c); *2260, 2261* (22); *2260* (22a).

Babcock, H. H. — (11).
Baehni, C. *668* (4).
Bailey, V. *575, 881* (5).
Baker, C. F. *391* (5); *189, 403, 486, 559, 560, 7599* (12); *1154, 1302* (12c); — (14); — (14b); *129, 558* (15); — (19); *191, 193* (19c); *293, 334, 497, 773* (20).

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[1] A great many specimens were seen which have not been cited in text because of space required. Many of those specimens will be found identified by the collector 's numbers in this index, but will not be found in the body of the text. In annotating specimens by collector 's numbers collections very often have been mixed, and in this index certain numbers are referred to under more than one name.

Baker, C. F., F. S. Earle & S. M. Tracy. *42, 234, 252, 825* (5); *180* (12); *206* (15); *576* (20).
Baker, C. F. & J. M. Holzinger. *86* (14b).
Baker, M. S. *729b* (4b); *4718b* (12); *4213* (12c); — (22a).
Baldwin, E. B. — (1).
Ball, J. — (14); — (14a).
Ballou, F. O. — (12a).
Bannister, H. M. — (1); — (4).
Barber, M. A. *198* (4); *333* (14).
Barbor, E. A. — (12).
Barbour, W. C. *613* (11).
Barker, — (16).
Barnett, J. *114* (8a).
Barthoud, E. L. — (14).
Bartlett, F. —, *155* (5); — (14c).
Bartlett, R. C. *13* (1).
Bassett, F. N. — (12c).
Batchelder, C. F. — (11).
Bates, J. M. *6410* (12); —, *6518½* (14); *6442, 6534* (14a); *6391, 6410* (18).
Bates, J. M. & F. Eastman. *163, 183, 202, 243* (14).
Bates, O. S. — (4).
Bayne Beauchamp Expedition. *110* (4).
Beals, R. — (24).
Beardslee, H. C. — (12).
Beattie, R. K. *4104, 4131* (4); *4304* (4b).
Bebb, R. *3204* (12); *3172* (14b).
Beckwith, F. *154* (5).
Bell, C. A. *133* (1).
Bell, J. M. — (4).
Bell, P. — (1).
Benedict, A. *112* (5).
Benke, H. C. *3699* (1); *1775* (11).
Bennett, R. L. — (24).
Bennitt, D. *20* (22a).
Benson, L. *2492* (4b); *3855* (12c).
Bereman, S. D. *769* (12); *770* (20a).
Berg, N. K. *4792* (14c); —, *1632* (18); — (19b).
Bergman, H. F. — (14).
Bessey, E. A. — (12); — (18); — (19).
Bethel, E. *25* (14).
Bethel, E., I. W. Clokey & H. M. Schmoll. *258* (14).
Bickle, M. E. — (4).
Biddulph, O. *5784* (18).
Biltmore Herbarium. *2700a* (18).
Bischoff, F. — (1).
Bishop, H. *522* (1).
Bissell, C. H. & D. H. Linder. *22345* (1).
Bitner, H. F. *2213* (11).
Black, F. F. *17, 36* (4).
Blaisdell, F. E. — (3).
Blake, J. — (1).
Blake, S. F. —, *5394* (1).
Blankinship, J. W. *376* (12); — (12a); — (18); — (19); —, *374, 374a, 374b* (22); —, *375* (22a); —, *374a, 374b* (22b).
Bliss, C. F. — (12).
Blumer, J. C. *Pr37* (5); — (12).
Bolander, H. N. —, *2487* (12c).
Bolton, A. L. — (4).
Bourgeau, E. — (4).
Bowdoin College Exped. to Labrador. *43, 73, 210* (1).
Bowen, W. J. *1* (8a).
Bowman, P. *288* (1).
Bradbury, J. — (14).
Brandegee, K. — (12c).
Brandegee, T. S. —, *472, 999* (4b); —, *277, 650* (12); —, *651, 654* (14); —, *256, 652* (19).
Branson, I. T. — (12c).
Brewer, W. H. *2787* (12c).
Brewster, W. — (1); — (12).
Bridgman, G. L. — (11).
Brigham, R. H. *13753* (14).
Brinkman, A. H. *2214, 3139* (4).
British Behring Sea Commission Collection. *186* (1).
Britton, N. L. — (4).
Broadhead, — (22a).
Broadhead, G. C. — (11).
Brooks, A. H. & L. M. Pringle. — (4).
Brooks, H. E. — (4).
Brown, A. — (12).
Brown, S. *1174* (4).
Bruce, C. C. *A* (22b).
Brumback, F. M. & C. A. Davies. *123* (14).

Bryant, O. — (1); — (3).
Buffum, B. C. —, *646, 647* (12); *645* (14); *644* (17); *643* (18).
Burglehaus, F. H. — (12a).
Burk, W. H. *48* (1).
Burke, — (4); — (12); — (16).
Burke, M. *3117, 3118, 3120, 3721, 3725* (22a).
Bush, B. F. — *365, 398, 4238, 4374, 14526, 14544* (11).
Butler, B. T. *751* (12); —, *750, 4230* (12a); *4186* (22a).
Butters, F. K. & C. O. Rosendahl. 4477 (4).
Byington. — (12).

Campbell, E. O. — (1).
Campbell, M. L. — (12c).
Canadian Arctic Exped. *146* (1).
Canby, W. M. — (1); — (10); —, *811*, (11); — (14a); — (18).
Cannon, W. A. & F. E. Lloyd. — (4).
Carter, J. J. — (11).
Cary, M. *577* (12); *308* (14).
Castetter, E. F. *73, 1071* (5); *1075* (14d); *762* (19b).
Chandler, H. F. — (11).
Chapman, J. W. *6, 69* (4).
Chase, V. H. —, *21, 1282, 1290* (11).
Cheney, L. S. *6516* (4).
Chesnut, U. K. & W. W. Jones. *110* (22).
Chickering, J. W. — (1).
Christ, J. H. *700* (14b); *6238* (22a).
Churchill, J. R. — (11); — (12); — (14); — (14a).
Clarke, J. F. G. — (4); — (24).
Cleburne, W. —, *1020* (8a); *25* (14); — (22a).
Clegg, C. E. — (4b).
Clemens, J. — (8a); — (12); — (12c); — (16); — (19e); — (22a).
Clemens, M. S. — (12c).
Clements, F. — (18); — (19).
Clements, F. E. & E. S. Clements. *288, 367, 376* (12); *124* (14a); *405* (18); *232* (19); *324* (20).
Clevenger, J. E. — (11).
Climer, B. L. — (24).
Clokey, I. W. *227* (11); *2746, 2851, 3157, 3519, 3553* (12); *2774, 2785, 3044, 3045, 3078, 3160, 3852, 3853* (14); *3033, 3043, 3062, 3161, 3847, 5746* (14a); *3309, 3849, 3856* (18); *2902, 3187, 3560, 3850, 3851, 3854* (19); *3293, 3294* (19d); *3292, 3848, 3992* (19e); *2999, 3522* (20).
Clokey, I. W., K. Bruderlin & C. B. Clokey. *4256* (19).
Clokey, I. W. & R. Duthie. *3846* (14a).
Clos, W. C. *122* (8a).
Clute, W. N. — (11).
Cockerell, T. D. A. —, *2, 17, 20* (5); — (8b); *6256* (14); —, *6256, 6257* (14a); *57* (14c).
Cockerell, T. D. A. & W. P. Cockerell. *82* (14c).
Cockerell, W. P. — (14c); *40* (19b).
Coffin. — (17).
Coghill, G. E. *67* (5); *4* (14d).
Collier, A. J. — (3); —, *10* (4).
Collins, J. F. — (22).
Collins, J. F. & M. L. Fernald. — (1).
Collins, J. F. & A. S. Pease. *4474, 4475* (1).
Collom, R. E. —, *237* (5).
Colvin, E. — (4).
Comer, G. — (1).
Commons, A. — (11).
Comstock, J. H. — (11).
Comstock, S. *15* (5).
Conard, H. S. *552, 626* (11); *1573, 1896* (18); *1289* (22b).
Condit, D. D. — (11).
Condon, D. D. *5766* (12); *5753, 5794* (18).
Constance, L. *9413* (4b).
Constance, L. & J. F. G. Clarke. *1280* (4b); — (18b).
Constance, L., J. F. G. Clarke, W. Staats & G. Van Vleet. *1166, 1170* (4b).
Constance, L., H. F. Clements & R. C. Rollins. *1066* (24).
Constance, L., A. Dimond, R. C. Rollins & C. Worley. *1105* (4b).
Constance, L. & C. D. Jacobs. *1385* (4b).
Cooley, G. E. — (1).
Cooper, R. D. — (22b).

Cooper, W. S. *97* (1); *100, 284* (12); —, *110* (14a); *74, 119, 169* (19).

Copeland, E. B. *450* (12c).

Copeland, H. F. —, *379, 1529* (12c).

Cornell Party on Peary Voyage, — (1).

Cottam, *3283* (5); *3490, 3754* (8a); *02270* (15); *3713* (20); *2847, 2908, 3176* (22a).

Cotton, J. S. *328* (22).

Coues, E. & E. Palmer. *299* (21).

Coulter, A. D. — (4).

Coulter, J. M. —, (14); — (14a); — (22a).

Courtney, W. D. — (24).

Coville, F. V. — (11); *2376* (24).

Coville, F. V. & E. I. Applegate. *404* (4b).

Coville, F. V. & F. Funston. *1398* (12c).

Coville, F. V. & T. H. Kearney. *1056, 1683, 2239* (1).

Coville, F. V. & J. B. Leiberg. *207* (13); *25* (22b).

Cowen, J. H. —, *817* (12); *1808* (20).

Cowles, H. C. *851* (1); *985* (4); *677* (4b); *16* (14).

Cox, C. F. *371* (19); *11* (20).

Craig, M. *6014* (11).

Cramer, M. — (22a).

Crandall, C. S. — (5); —, *1306, 1307, 1308, 1309, 1638, 1644, 1645* (12); *155, 360, 1635, 1636* (14); *1637* (15); —, *739, 1819* (19); — (19d).

Crandall, C. S. & J. H. Cowen, *359* (20).

Cringer, F. *237* (12a).

Crocker, — (1); — (18).

Cross, W. *6* (5).

Culbertson, *4375* (12c).

Culbertson, T. A. *3, 4* (14).

Curtis, C. C. — (12); — (18).

Curtiss, A. H. — (1); — (11).

Cusick, W. C. —, *211, 1911a, 3292, 3296, 3392, 3474* (4b); *3875, 3895* (6a); *856, 1886, 2807* (13); *1629, 2376* (22a); *2582* (22b); *41, 1830, 3151, 3155, 3159, 3169, 3424* (24).

Dall, W. H. — (1); — (4).

Daniels, F. *320* (12); *14* (14).

Darlington, H. T. —, *49, 383* (4b); *2* (13).

Darlington, J. *4* (22a).

Davis, C. A. — (1).

Davis, J. —, *1236, 2523, 3309, 3541, 6391, 7207, 7280, 7296* (11).

Davis, R. J. *D23–32* (22); — (22a).

Davis, T. C. *3058* (11).

Davison, R. T. — (22b).

Deane, W. — (1).

Decker & Eggertsen, — (16).

Deehl, I. E. — (12).

De Forest, H. P. *364g* (11).

De France, J. A. — (12); — (14); — (19); — (19e).

Derby, C. — (12c).

Dewart, F. W. — (22b).

Dick, W. M. — (11).

Dickson, J. — (4).

Dirce, T. *7481* (12).

Dixon, J. *11, 24* (4).

Dodds, G. S. *1851, 1925* (14).

Dodds, G. S. & W. Robbins. *5819* (19).

Donaghe, R. — (22a).

Douglas, J. E. — (11).

Drake & Dickson. — (6a).

Draper, C. H. — (22a).

Drushel, J. A. *1705, 1904, 4065, 4066* (11); — (12); — (18).

Dunkle, M. B. — (24).

Duran, V. *3071* (12c).

Eames, A. J. *8677* (11).

Eams, J. O. — (16).

Earle, S. F. — (11).

Eastwood, A. *741* (1); —, *137, 903* (4); —, *94* (4a); *7764* (8a); — (12); *189, 1318* (12c); —, *5543, 5488, 7082* (14); —, *5402* (14a); *5365a* (15).

Eastwood, A. & J. T. Howell. *481* (8a); *441* (12); *209* (22); *209, 223, 299* (22a).

Eaton, D. C. *247* (12).

Eaton, D. W. —, *36* (4).

Eby, A. F. — (12).

Edmonds, H. W. — (11).

Edwards, H. — (12c).

Eggert, H. — (11).

Eggleston, W. W. *12970, 13535* (4b); *6652, 10164, 10168, 10302, 10344, 16845, 18835, 19332, 20021* (5); *10399* (8); *13883* (8a); *5881, 11260, 11883, 14075* (12); *13960* (12a); *9321* (12c); *12523* (14); *1175* (14a); *5669* (15); *6059* (20); *6926, 9007, 13841* (22a); *22017* (22b).
Eisenhower, C. W. — (11).
Ekblaw, W. E. —, *616* (1).
Ellis, C. C. *12* (14c).
Elmer, A. D. E. *793* (4); *1195, 2826* (4b); —, *31, 158, 1584* (24).
Elrod, M. J. — (11); —, *9* (22a).
Emerton, J. H. — (4).
Engelmann, G. — (6); — (14); — (14a).
Engelmann, H. — (12); — (16); — (19a); — (22).
English, C. *134, 800* (4b).
Epling, C. *6002, 7308, 7391, 7396, 7494* (4b); *5578* (6a); *5651* (11).
Epling, C. & J. M. Hauch [Houck]. *9355, 9496, 9541, 9608* (4b).
Euler, C. — (14a).
Evans, H. M. — (12c).
Evans, W. H. *160, 307, 308, 700* (1); *476, 737* (4).
Evermann, B. W. *18* (1); — (11); — (12).

Fallcott, J. — (4b).
Farwell, O. A. *282, 2111* (4).
Fassett, N. C. *2262, 2263* (1).
Fassett, N. C. & H. V. Truman. *13034* (11).
Faxon, E. — (1).
Faxon, E. & C. E. Faxon. —(1).
Fendler, A. *626* (5); *625* (14c).
Fenno, F. E. *291* (11).
Ferguson, M. C. & A. M. Ottley. *5381* (5); *5303* (14).
Fernald, M. L., E. B. Bartram, B. Long, & N. C. Fassett. *24411* (1).
Fernald, M. L., E. B. Bartram, B. Long & H. St. John. *7958* (1).
Fernald, M. L. & D. H. Linder. *22349* (1).
Fernald, M. L. & B. Long. *22347, 24412, 28954* (1).
Fernald, M. L., B. Long & B. H. Dunbar. *26994, 26995* (1).
Fernald, M. L., B. Long & J. M. Fogg. *387, 388* (1).
Fernald, M. L., B. Long & D. H. Linder. *22348* (1).
Fernald, M. L., B. Long & H. St. John. *7959* (1).
Fernald, M. L. & A. S. Pease. *3493* (4).
Fernald, M. L. & L. B. Smith. *25992* (1).
Fernald, M. L. & H. St. John. *11165* (1).
Fernald, M. L. & K. M. Wiegand. *3923, 3924, 6101* (1).
Fernow, B. E. — (1).
Ferril, W. C. — (5); — (12); — (14); — (14a); — (15); — (16); — (19).
Ferris, R. S. & R. Duthie. *252* (22a); *125* (22b).
Fiker, C. B. *862* (4); *1652* (22a); *40, 584* (24).
Fink, B. — (11).
Finley, C. *5* (22a).
Finley, W. L. — (4b).
Finsley, J. D. — (11).
Fisher, G. L. — (11).
Fitzpatrick, T. J. & M. F. L. Fitzpatrick. — (11).
Fleming, C. E. *91* (12).
Flett, J. B. *1536* (3); — (4b).
Flint, M. B. — (11).
Flodman, J. H. *751* (12); *752* (22a).
Fogg, J. M. *1558, 4056* (11).
Fontanilla, A. E. *947* (24).
Forbes, F. F. — (1).
Forwood, W. H. —, *32* (12); *267* (14).
Foster, A. S. — (24).
Foster & Osburn, *4810* (5).
Fowler, J. — (1).
Fox, C. L. — (12c).
Fremont's Exped. to Rocky Mountains. —, *425* (12).
Fries, T. M. — (1).
Fritchey, J. Q. A. — (12); — (19).
Fuller, H. J. — (12).
Fulton, H. J. *8209* (5).

Funston, F. *50* (1); *53* (4a).
Furbish, K. — (1).
Furlong, H. W., W. B. Greeley, M. Wilson & A. Alexander. — (22a).

Gabby, M. B. *8* (24).
Gageby, S. — (4b); — (22a).
Gail, F. W. — (4); — (12).
Gale, N. P. *145, 177, 180,* (22a); *140a, 145, 152, 165, 169* (24).
Gardiner, W. — (1).
Gardner, E. — (14a); — (19e).
Gardner, G. *129, 374* (1).
Garrett, A. O. *1516, 2145, 2717, 2909, 3035, 3473, 3967, 6187, 6355, 6561, 6578* (8a); *1510, 1513, 1888, 3696a, 5674, 5685, 5725, 5760* (12); *1075, 2716, 2958, 3030* (16); *5685, 5698* (20);*1074* (22a).
Gates, F. C. *1380, 1407* (11).
Gattinger, A. — (11).
George, B. M. *863* (4).
Gerber, R. *3720* (22a).
Geyer, *316* (24).
Geyer, C. A. *24* (14).
Gibbs, C. D. — (12c).
Gilbert, E. J. C. — (1).
Gilbert, F. A. *38* (11).
Gilman, M. F. *583* (24).
Gleason, H. A. —, *359, 2579* (11).
Glenn, E. F. — (4).
Goddard, P. E. *448* (4).
Golder, F. A. *63* (1).
Goodding, L. N. *178, 540, 594, 1173* (5); *855, 1145* (8a); *409, 1200, 1855* (12); *178, 409, 594, 1173* (12a); *1222* (15); *447* (18); *1777, 1827, 1889* (19); *1827* (19a); *1386, 1519* (20a).
Goodman, G. J. *1883* (8a); *621, 1824, 1837, 1842, 1899* (12); *700* (14); *382, 1830* (16); *1971* (20).
Goodman, G. J. & C. L. Hitchcock. *1387, 1443* (5); *1578* (8); *1492, 1513* (12); *1523* (20).
Gorman, M. W. *102, 277* (1); *170* (3); *999, 1076* (4); (22a).
Gottschalch, C. — (22b).
Graham, E. H. *8141, 9228* (8a); *9667* (8b); *6552, 8393, 8569, 10086* (12); *6303, 7806, 8067, 8099, 8120, 8198, 9114* (15); *9248* (16); *9070* (19); *8424, 8565* (20).
Grandjean, E. *84* (4b).
Granstand, E. — (24).
Grant, G. B. *776, 1239* (12c).
Grant, J. M. — (4b); —, *831* (6).
Graves, E. W. *1740* (11); *2283* (12).
Gray, A. *364* (11); — (12); — (19).
Greene, E. L. — (5); — (12); *303* (14); —, *613* (14a).
Greenman, J. M. — (11).
Greenman, J. M. & M. T. Greenman. *6196* (19a).
Greenman, J. M., O. E. Lansing & R. A. Dixon. *100* (11).
Griffin, A. A. *139* (20).
Griffiths, D. *5345* (5); — (12).
Griggs, R. F. — (1).
Grover, F. O. & C. L. Booth. — (11).

Haenke, T. *2.2370* (1).
Hagelbarger, P. R. *112* (1).
Hahn, W. L. *44* (1).
Haley, G. — (1); — (3).
Haley, G. & Haley. — (1).
Hall, C. H. — (12).
Hall, E. *405* (6a); — (14a).
Hall, E. & J. P. Harbour. *442* (12); *445* (14); *134, 445* (14a); *443* (18); *444* (20a).
Hall, H. M. —, *11447, 11531* (12); *11599* (12a); *9784* (12c); *10387* (14); — (19); — (19a).
Hall, H. M. & H. P. Chandler. *456* (12c).
Hankenson, E. L. — (11).
Hanna, G. D. — (1).
Hanna, L. A. *1344* (12); *148* (14); *100* (19a).
Hansen, G. *424* (12c).
Hansen, S. — (1).
Hanson, H. C. *145* (5); *C294* (12); *C293* (14); *C295* (14a).
Hanson, H. C. & E. E. Hanson. *A605* (5).
Hapeman, H. — (11).
Harper, E. T. — (14); — (19); — (20).

Harper, E. T. & S. A. Harper. — (14); — (18).
Harper, R. M. *3313* (11).
Harrington, G. L. *36, 88* (1); *13, 72, 74* (4).
Harrington, M. W. — (1).
Harrison, A. K. & W. H. Harrison. *9* (1).
Harrison, B. F. *5805* (8a); *5895* (15); *7323, 7550* (16); *5784* (18).
Harrison, B. F. & E. Larsen. *7741, 7742, 7885* (12); *7618* (15).
Harrold, C. G. — (1).
Harvey, F. L. & L. H. Harvey. — (1).
Hawkins, P. H. *633* (12a).
Hayden, F. V. — (12); — (14); — (17); — (22a).
Hayward, H. E. *746, 901, 940, 995, 1038, 1252, 1369, 1423, 1435, 1763, 1878, 1934* (14).
Heading, A. J. *2109* (11).
Heath, H. — (1).
Hedgcock, G. G. — (11).
Heideman, C. W. H. *51, 74* (4).
Heller, A. A. *420* (4); *14794* (4b); — (11); —, *9236, 9327, 9373* (12); *9181, 10541, 10546* (22); *10003, 10546* (22a); *75* (24).
Heller, A. A. & E. G. Halbach. —, *1325* (11).
Heller, A. A. & E. G. Heller. *3641* (5); *3872* (6); *3501* (14); *3640* (14c); — (24).
Henderson, L. F. *2813* (4); *647* of 1924, *2259* (4b); *3193, 8312* (12); *8113* (22a); *8315, 8316, 8318* (22b); —, *5008, 5216, 8314* (24).
Henderson, M. P. *17, 18* (16); *19* (22a).
Hendricks, B. A. — (14).
Henry, T. C. — (5).
Herb. Colo. State Agric. College. —, *1639* (12); *633, 4157* (14); — (14c); *4189* (19).
Hermann, F. J. *4934, 4934½, 5378, 5441, 5959, 5967* (12); *4615* (14); *5150, 5208, 5978* (20).
Herrick, C. L. *200, 260* (14c); *260* (14d).
"Hffl." — (4).
Hicks, G. H. — (14d).
Hill, E. J. *1280, 1312* (11).
Hill, G. A. *10* (3); — (24).
Hilsman, A. — (4).
Hitchcock, A. E. *1107, 1388* (12).
Hitchcock, A. S. *12075, 12097* (4); — (5); — (11); — (12c).
Hitchcock, C. L. *1761* (4); *2109, 2169* (4b); *2061* (12a); *1530* (22a).
Hobbs, M. *7, 50* (17).
Hollick, A. — (4).
Hollister, N. *69* (4).
Holm, T. — (19).
Holms, M. E. — (11).
Holway, E. W. D. — (4); *30* (18).
Holzinger, J. M. *16* (12); — (14); *47* (20a).
Hooker, J. D. & A. Gray. — (19).
Hopping, R. *65* (12c).
Horne, W. T. — (1).
Horner, R. M. *367, B367* (4b); —, *366, R155B366* (24).
House, H. D. *4930* (4); —, *6920, 9211* (11).
Howard, W. J. *304* (12a).
Howe, C. D. & W. F. Lang. *23, 1275* (1).
Howell, John Thomas. *6881* (4b); *209* (12c).
Howell, Joseph. — (22a).
Howell, Thomas. — (4b); — (6a); — (22a); — (24).
Huddle, C. I. *27* (12a).
Huestis, W. *2117* (12); — (14); — (18); — (19); —, *6061* (19e); — (20).
Hughes, E. L. *1* (14).
Hughes, J. A. *1261* (22a).
Hunter, B. *11* (24).
Hutchins, T. — (4).
Hutchinson, I. W. *2, 4* (4).
Hyatt, S. V. — (1).

Jack, J. G. — (18).
Jackson, — (12c).
Jaeger, E. C. — (8c).
James, E. — (12); — (18).
Jamieson, R. H. *196* (24).
Jardine, J. T. *186* (24).

Jeffries, W. W. — (11).
Jenkins, E. H. & R. Thaxter. — (1).
Jepson, W. L. *230* (1).
Jewell & Woods. *69* (12).
Johansen, F. —, *146*, *370*, *513* (1).
Johnson, F. W. —, *1639* (11), *123* (12).
Johnson, R. B. — (22a).
Johnston, E. C. — (1); — (4b).
Johnston, E. L. *80*, *123* (12); *83*, *128*, *197*, *374b*, *460*, *534*, *535*, *541* (14); *18* (18); *354a* (19e).
Johnston, I. M. — (1); *2814* (14); *2811*, *2812*, *2813* (18).
Johnston & Hedgcock. *533*, *538* (5); *542* (12); *529a*, *530*, *531*, *533a*, *535*, *539*, *540*, *541*, *543* (14); *529* (14a); *536* (19).
Johnston, H. W. & L. J. Palmer. *15* (1); *24* (4).
Jones, B. J. — (22).
Jones, G. N. *727*, *1673*, *2869* (4); *189* (4b); *4126* (22b); *251*, *2826*, *6332* (24).
Jones, H. — (12).
Jones, H. L. *1323* (11).
Jones, I. *25* (4).
Jones, M. E. —, *25016*, *28914* (4b); —, *4106*, *5441a*, *5441aa* (5); *4007* (7); *5375W*, *5957a* (8); —, *5585*, *6471* (8a); —, *5801* (8c); — (11); —, *693*, *1256* (12); — (12a); —, *15* (14); *14* (14); —, *2148*, *6472* (16); *54* (18); *916*, *5688* (19); *54* (19e); — (22); —, *2038*, *2148*, *8658*, *8858* (22a); — (24).
Jones, W. W. — (22); — (22a); — (22b).
Jussel, M. S. — (12c).

Kearney, T. H. —, *133* (11).
Kearney, T. H. & R. H. Peebles. *9960* (5).
Kelley, G. E. — (4b).
Kellogg, A. —, *270* (1).
Kellogg, J. H. —, *485* (11).
Kelly, F. W. — (1).
Kelsey, F. D. — (12a); *62* (22); — (22a); —, *62* (22b).
Kelso, L. *1083* (12).
Kemp, J. F. *41* (12).
Kennedy, G. G. — (1).
Kennedy, G. G., E. F. Williams, J. F. Collins & M. L. Fernald. — (1).
Kennedy, P. B. *4266* (12); *511* (22); *1661* (22a); *512* (22b).
Kennedy, P. B. & G. H. True. *711* (22a).
Kenney, H. — (22).
Ketchum, F. E. — (1).
Kiener, W. — (14a); *1045*, *1046* (19); — (19e).
Kilborne, F. L. — (11).
Kimpton, A. — (22); — (22b).
Kincaid, T. — (6).
King, A. *29* (11).
King, C. — (4b).
King, M. A. — (22a).
Kirkwood, J. E. *1258*, *2005* (4); *1611*, *1881*, *2005* (4b); *1259*, *1260*, *1362*, *1731*, *2057*, *2514* (22a).
Kirkwood, J. E. & J. W. Severy. *1611* (4b).
Kirtley, C. L. — (12a).
Kittredge, J. — (22a).
Knowlton, C. H. — (1).
Knowlton, F. H. *75* (5); —, *56* (12); — (12a).
Kobuski, C. E. — (11).
Koch, P. —, *34* (18).
Koelz, W. *60* (1).
Kofoid, C. A. — (11).
Kreager, F. O. *190*, *202*, *216* (4).
Krumlein, L. — (1).
Kuntze, R. E. — (5).
Kusche, J. A. — (1); — (4); — (5).

Lackey, C. F. — (4).
Laing, H. M. *101* (4).
Lake & Hull, —, *639* (4b).
Lamb, F. H. *1383*, *1383a* (4b); *1168* (6).
La Motte, *4* (24).
Landmark, J. R. —, *285* (1).
Larabee, L. L. *687* (1).
Larsen, E. L. *12* (14); — (22a).
Lawrence, W. E. *81* (4b).
Lawrence, W. H. *359* (4b).
Leach, J. R. *8317* (22a).

Leach, J. R. & Mrs. J. R. Leach. *1507* (2).
Leach, L. — (2).
Le Conte, R. G. — (18).
Lee, H. *526, 530, 538, 557* (14).
Leedom, B. F. — (11).
Leiberg, J. B. —, *1136* (4); *1217, 2834* (4b); *5582, 5765* (5); *2166* (22a); *2178* (22b); — (24).
Leidy, J. — (12).
Lemmon, J. G. — (5); —, *164, 473* (12c); — (22a).
Lemmon, J. G. & Mrs. J. G. Lemmon. — (5).
Leonard, F. E. — (8a); —, *32* (22a).
Letterman, G. W. — (11); — (12); *155* (14); *339* (18); —, *339* (19).
Lewis, — (4).
Lindstrom, A. H. — (4).
Lloyd, F. E. — (4b); — (6a).
Lodewyks, M. C. *86* (11).
Long, B. & D. H. Linder. *22346* (1).
Long, B. & H. St. John. *2448* (11).
Lothian, M. — (17).
Lucy, T. F. *1202, 2109, 7601, 10583* (11).
Lunell, J. — (14).
Lyall. — (4b); — (24).
Lyles, C. S. — (24).
Lylow. — (1).
Lyon, M. W. — (11).

Macbride, J. F. *416, 693* (12); *2252, 2726* (17); *942,* (22a); *856* (22b).
Macbride, J. F. & E. B. Payson. *2907, 3724* (10); *2926, 3282, 3491, 3742, 3759* (12); *3119, 3272, 3279, 3282, 3492* (12a); *3143, 3544* (22); *2890, 3065, 3092, 3191, 3335* (22a); *3143, 3522, 3557, 3846* (22b).
MacDougal, D. T. *3, 428* (4); *232, 251* (5); —, *95* (21); *187* (22a).
Mac Elwee, A. *1361* (11).
MacFadden, F. A. *13853* (4b).
MacGregor, R. C. — (4).
Mackenzie, K. K. — (11); *321* (12); *220* (19).
Mackenzie, K. K. & L. Griscom. *10414* (1).
Maclay, A. *41* (22).
MacLean, J. — (4).
Macoun, J. — (1); —, *73, 14132, 78739, 78741, 78742, 78743, 78744* (4); *11838* (14); *66567, 76738* (24).
Maguire, B. *12995* (8); *2438, 13105* (16); *3719, 3722, 3724* (22a).
Maguire, B. & R. J. Becraft. *2784, 2785* (22a).
Maguire, B., M. Burke & R. Gerber. *3119* (22a).
Maguire, B. & R. Maguire. *42, 3726* (12); *1211* (18); *3723, 13103* (22a).
Maguire, B. & J. D. Redd. *2109, 2110, 2111, 2112, 2113, 2115* (5); *2116* (12); *2117* (19).
Maguire, B., B. L. Richards & R. Maguire. *4241, 4244* (12); *4237, 4238, 4239, 4240* (20).
Maguire, B., B. L. Richards, R. Maguire & R. Hammond. *5116, 5118, 5119, 5120, 5121* (5); *5115, 5116* (12); *5109, 5110, 5111, 5112, 5113, 5114* (19).
Maltby & G. E. Coghill. *67* (5); *4* (14d).
Malte, M. O. —, *157, 437, 1110* (1).
Mangun, C. M. *147* (4b).
Manning, M. H. *83* (22); *83* (22a).
Marcy, O. — (24).
Maris, H. B. *45* (24).
Marsh, C. C. *177* (5).
Marsland, — (18).
Mathias, M. E. *686* (8); *546* (11); *396* (14a); *419* (19e).
Matthews, W. A. *2085* (11).
Maxon, W. R. — (11).
Mayferth, A. W. — (11).
M'Cain. — (10).
McAtee, W. L. — (1).
McCalla, W. C. *445* (11).
McCarty, E. C. *36* (19).
McDonald, F. E. — (11).
McDonald, J. — (1); — (4); — (12a); — (12c).
McGrath, J. E. — (4a).
McIlhenny, E. A. *96* (1).
McIntosh, A. C. *No. V, 148, 690* (14).
McKay, C. L. — (4).
McKelvey, C. W. — (5); — (21).

McKelvey, S. D. *4666, 4722* (5); *4243* (8a); *2403, 2444, 4776* (14); *4820* (14d); *4764* (15).
McMullen, E. C. — (1).
Mead, S. B. — (11).
Mearns, E. A. —, *162, 1547* (5); *1818, 1939, 1940, 3713* (12); —, *1126, 2046* (12a).
Meehan, T. — (14).
Meehan, W. E. *53* (1).
Mendenhall, W. C. — (4).
Meredith, H. B. — (19).
Merriam, C. H. — (1).
Merrill, E. D. *360* (12).
Merrill, E. D. & E. N. Wilcox. *1129* (12); *698* (22).
Merryfield, L. A. — (22).
Mertens, — (1).
Mertie, J. B. *99* (4); —, *35* (4a).
Mertz, H. N. —, *65* (11).
Metcalfe, O. B. *302, 1319* (5).
Mexia, Y. *2079* (4).
Michaels, E. — (12c).
Milburge, M. *499* (4).
Miller, G. S. — (4).
Miller, W. B. *114-c* (3).
Millspaugh, C. F. —, *15* (11).
Miner, O. —, *86* (24).
Moldenke, H. N. *7197* (12).
Moodie, M. E. —, *4, 1053* (4).
Moon, M. B. *25* (11).
Moore, A. H. *330* (1).
Moore, E. J. — (22); — (22b).
Moore, F. L. *96* (24).
Moore, F. L. & C. E. Moore. — (12); — (23).
Moore, J. P. *546* (12c).
Morgan, R. E. — (14).
Morgan, S. L. — (14).
Morong, T. — (11).
Morris, E. L. —, *1463* (11).
Morris, G. H. — (1).
Moseley, F. Y. —, *A316* (19).
Mosier, C. A. — (4b).
Muenscher, W. L. C. *352* (4); *1037* (4b); *351* (24).
Muenscher, W. L. C. & A. R. Bechtel. *339* (11).
Muenscher, W. L. C. & B. Maguire. *2435* (16); *2436, 2437* (22a).
Muenscher, W. L. C., G. L. Wilson & A. S. Foster. *15899* (11).
Muir, J. *60* (1).
Mulford, A. I. — (4b); *850* (5); — (12); — (22b).
Muller, A. — (4).
Mulliken, E. *143* (12c).
Munz, P. A. *119* (12); *7502* (12c); *118* (18); *2967, 3046* (19).
Murdoch, J. *4610, 4669* (5); *4639, 4852* (12); *3023, 3069* (14); *4547* (20).
Murdock, — (1).
Murie, M. E. — (4a).
Murie, O. J. —, *1317, 1318* (4); *124* (22a).
Mylroie, R. *138* (1).

Nelsen, — (1).
Nelson, A. *188, 313, 408, 689, 1028, 1031, 1392, 7321, 7752, 8531, 8695, 8723, 9422* (12); *2430* (12a); *34, 1234, 1904, 2936, 3174, 7332, 10515, 10623, 11306, 11497* (14); *10427, 10429, 10444, 10474* (15); *11364* (16); *33, 1222, 1234, 3777, 4326, 7043, 9735* (17); *1211, 2430, 2434, 7549* (18); *1608, 7549* (19); *7844, 7870, 9149, 9683, 9686, 10554, 10574* (19a); —, *9828, 9859* (20); *5413a, 7072, 10082* (22); *2951, 3593, 5413a, 7071, 9007, 9016, 10082* (22a); *D9, 5413a, 10082* (22b).
Nelson, A. & R. E. Ashton. *324* (14a).
Nelson, A. & J. F. Macbride. *1854, 1994* (12); *1938, 1995* (22); *1938, 1995* (22a); *837* (22b).
Nelson, A. & E. Nelson. *5669, 5835* (12); *5669, 6704* (12a); *5811* (18); *5413,* (22a); *5413, 5556* (22b).
Nelson, A. & R. A. Nelson. *667* (13).
Nelson, E. *4931* (9); *76* (12); *184* (19); *5182* (19a); *1213* (22a).
Nelson, J. C. *1910, 2786, 5091* (4b); *607, 669, 1111, 2137, 2255, 3495, 3794* (6a).
Nichols, G. E. *1254* (1).
Nichols, H. W. *8, 14, 26, 62* (4).

Nielsen, H. P. *14* (4).
Noll, H. R. — (11).
Norris, H. W. — (11).
Nuttall, T. — (4b); — (6a); — (14).

Oleson, O. M. — (12); — (12a).
Ollerton, S. H. *200* (8a).
O'Neal, *8* (24).
Onion, I. S., R. Kennicott & W. L. Hardisty. — (4); — (4a).
Onstot, T. — (4).
Osbanie, P. R. — (6a).
Osgood, W. H. — (4).
Osterhout, G. E. *1870* (5); —, *308, 1713, 1869, 2156, 2163, 2449, 2823, 3284, 3728, 3780, 5499, 5651* (12); —, *631, 2211, 2396, 2797, 2825, 3222, 3249, 3249B, 5627, 5634, 5635, 5647, 5648, 5723, 5878, 5879, 6530* (14); *309, 2210, 2824, 4882, 5629, 5652, 5722, 5724, 5725* (14a); *2211, 5498* (14b); *2182, 2561* (16); — (17); *3277, 5389* (18); —, *2439, 2848, 3116b, 4353, 6281* (19); *2847* (19e); *2164, 5355, 6828* (20); *3225, 4240, 6066* (20a).
Ostheimer, A. J. *10B* (4).
Otis, *699* (4b).
Over, W. H. *14372, 17613, 18092* (14).
Overholts, L. O. — (12); — (14).
Overton, E. — (14).
Ownbey, M. *555, 555a* (14); *811, 841* (23).
Oyster, J. W. —, *5856* (11).

Palmer, E. *2* (4); —, *347* (8); —, *378* (12).
Palmer, E. J. *619* (5); *5656, 14987, 17230, 30239, 35376, 35851, 39154* (11); *31264* (12); *36987* (12a); *31243, 31395, 37035, 37135, 37158, 37355* (14); *31281a, 31282a* (19e).
Palmer, L. J. *1599* (3); *400* (4).
Palmer, W. —, *546* (1).
Pammel, L. H. — (12).
Pammel, L. H. & R. E. Blackwood. *3820, 4234* (12).
Pammel, L. H. & E. M. Stanton. — (12); — (12a); — (18).
Papineau, E. A. *65* (12).
Parker, C. F. — (11).
Parker, C. S. *493, 683* (4); *327* (24).
Parks, H. E. & S. T. Parks. *21049* (4b).
Parry, C. C. —, *285, 442* (12); *284* (14); *285* (14a); *287* (18); —, *286, 287* (19); *287* (19d).
Patterson, H. N. *103, 115* (14); —, *115* (14a); *113* (19); —, *113, 114* (19e).
Patterson, H. N. & F. Beaty. — (19); — (19d).
Patton, M. — (4).
Payne, F. *57* (22b).
Payson, E. B. *552* (5); *538, 1568, 3582* (12); *376* (15).
Payson, E. B. & G. M. Armstrong. *3354, 3442, 3582, 3668* (12); *3232A* (22a).
Payson, E. B. & L. B. Payson. *3905, 3949* (5); *4830, 4927* (8a); *1956, 1957, 1999, 2050, 2140, 2726, 2886a, 2971, 3950, 4929* (12); *2612, 2749* (15); *4918* (16); *4737* (17); *2043, 2977, 4467* (18); *2886, 2979, 3983, 4032* (19); *5156* (19a); *4185, 4913, 5025, 5086, 5137* (20); *1797* (22a); *1863* (24).
Pearce, O. E. — (11).
Pearson, D. & E. Pearson. *36* (12a).
Pease, A. S. *2482* (1); *17944, 18032* (4); *11835* (11).
Pease, A. S. & R. C. Bean. *23472* (4).
Peck, M. E. *5811, 8253, 8343, 16462* (2); *9233, 10356, 15817, 17464, 17915* (4b); *5349, 5350, 7443, 18654* (6a); *14128, 16040* (12); *15578* (13); — (14a); *5588* (22); *14256, 15403* (22a); *2914, 2920, 3236* (22b).
Penard, E. *474, 529* (18).
Perdew, S. S. — (11).
Perkins, A. E. — (1); — (11).
Perry, R. C. — (11).
Perry, L. M. & M. V. Roscoe. *332* (1).
Petersen, J. L. *125* (4b).
Phelps, K. E. — (12); — (14); — (14a); — (19).
Philipps, V. — (14).
Pickett, F. L., R. L. McMurray & L. A. Dillon. *1456* (22a).
Pickett, R. *100* (12).
Pierce, G. C. — (19).

Pilsbry, H. A. — (5).
Piper, C. V. *4441* (1); *1691, 4440* (4); —, *919, 1691, 2116* (4b); —, *1875* (24).
Piper, O. A. — (4).
Pollard, C. L. *78* (11).
Pollock, W. M. — (11).
Pool, R. — (14); — (18).
Popenoe, E. A. — (20).
Porsild, A. E. —, *417* (1).
Porsild, M. P. — (1).
Porter, C. L. *514, 1036, 1292, 1460, 1461* (14).
Porter, T. C. — (12); — (14).
Poto, W. L. *64* (4).
Potter, A. F. — (8a).
Potter, D. *695* (1); *680, 686, 687, 689, 694* (4).
Prager, A. *16993* (1).
Pratt, A. D. — (1); — (14).
Preble, A. E. & M. Cary. *24* (4).
Preble, A. E. & G. Mixter. *534, 622* (4).
Preston, C. M. — (19).
Preuchier, *670b* (1).
Price, S. F. — (11).
Priest, M. E. — (1).
Pringle, C. G. — (1).
Pulling, H. E. — (4).
Purpus, C. A. — (5); —, *5233* (12c); *139* (15); *6675* (19); *548* (20).

Quayle, E. H. *15* (22); *15* (22a).
Quick, C. R. *1157* (4); *1030* (13).

R., E. C. & J. A. L. *119* (24).
Rader, *25* (4).
Ramaley, F. *752, 1176, 3179, 3220, 3327, 3817, 5222, 5349, 5924, 6085, 6316, 6613, 11438* (12); —, *1022, 1392½, 6671, 9355, 9573, 9574, 9785, 9974, 10298, 10370, 10412, 10422, 10607* (14); *1131, 4826, 6309, 9131, 10649, 12013* (14a); *11773* (17); *3325, 3326, 10649, 10690, 11446* (19); *1178* (19d); *6366, 6618, 6737, 10666, 11387* (19c); *6266, 8681, 8689, 9530* (20a).
Ramaley, F. & I. W. Clokey. *3855, 3976* (19).
Ramaley, F., G. S. Dodds & W. W. Robbins. *3179, 3220* (12); *3247* (19).
Ramaley, F. & W. W. Robbins. *2466, 2566, 2806, 3327, 3399, 3651, 5177, 5222, 5687, 6031* (12); *2717, 2828* (14); *1750, 3110* (14a); *2411, 3325, 3326, 5217* (19); *9131* (19e); *4628* (20a).
Raup, H. M. & E. C. Abbe. *3511, 3633, 3871, 3940* (4).
Raymond, H. H. — (11).
Redfield, J. H. — (1); — (11); — (12); — (14); — (19).
Reed, M. — (11).
Renvall, A. *331* (1).
Rhodenbaugh, E. F. *18* (12a).
Richards, B. L. *4242, 4243* (12).
Richardson. — (4).
Ricksecker, A. E. — (11).
Ridgway, R. *2485, 2486, 2487* (11).
Ried, C. *4* (24).
Riehl, N. *206* (11).
Riggle, F. D. *12* (12a).
Ritter, H. L. & H. M. Schmoll. *633, 634* (14).
Robbins, W. W. *146* (4); *4936* (5); *2177, 2208, 2308, 4969, 5806, 5842, 5924, 7700, 7740,* (12); *6228* (14); *7632* (14a); *5819* (19); *7554* (20a).
Robbins, W. W. & D. Prosser. *6394, 6438* (14).
Robinson, C. B. *730* (1).
Robinson R. *16* (1).
Rodman, R. & F. P. Metcalfe. *3057* (11).
Rogers, R. *8319* (22b).
Rollins, R. C. *25* (14); *25* (14a); *478* (22a); *404* (23); *861* (24).
Ronan, K. *74* (22a).
Ross, E. A. — (11).
Rothrock, J. T. — (1); *52* (4); *246* (5); *421* (12c).
Rounds, M. — (6a).
Rowlee, W. W. —, *628* (11).
Rugel. — (11).
Rusby, H. H. —, *291* (5).
Rusk, W. — (14a).
Russell, C. — (4); — (11).
Rust, H. J. *155* (4).
Ruth, A. —, *147, 3236* (11).

Rutter, C. *212* (1).
Rydberg, P. A. *8310* (4); *6098, 6743, 6863* (8a); —, *2777* (12); *11, 257, 897, 899, 900* (14).
Rydberg, P. A. & E. A. Bessey. *4876* (12); *4864, 4872, 4875, 4876* (12a); *4865, 4866, 4867* (18); *4869, 4870, 4871, 4873, 4874* (22a).
Rydberg, P. A. & M. A. Carlton. *7061, 7077, 7285* (8); *6347, 6442, 6480, 6516* (8a); *6436, 6438, 6470* (12).
Rydberg, P. A. & O. A. Garrett. *8597, 8598, 9531, 9775, 9776, 9814* (5); *8721, 8848, 8960, 8999* (12); *8653, 8957, 8958, 8959, 8998* (19).
Rydberg, P. A. & F. K. Vreeland. *5683, 5685* (5); *5692, 5693* (12); *5686, 5687, 5695* (14); *5688, 6615* (14a); *5690, 5690a, 5691* (19).

Sampson, A. W. — (8a).
Sampson, A. W. & G. A. Pearson. *26* (4b).
Sandberg, J. H. —, *104, 448* (4); — (4b); *172* (24).
Sandberg, J. H., D. T. MacDougal & A. A. Heller. *420* (4); *75, 75a* (24).
Sandberg, J. H. & J. B. Leiberg. —, *678* (4b); —, *48* (24).
Sanford, J. H. — (22a); — (24).
Sarastana, S. F. — (14).
Saunders, D. *4809, 4810* (1); — (12); — (14); — (18).
Savage, Cameron & Lenocker. — (4b).
Schaffer, C. — (4).
Schaffer, Mrs. C. *1568* (4).
Schedin, L. M. & N. T. Schedin. *315* (14a); *314, 323* (18).
Scheuber, E. W. *42* (12a); — (22).
Schmoll, H. M. *1152* (5); *157* (14); *4, 558, 559* (19).
Schneck, Y. — (14).
Schrader, F. C. & G. H. Hartman. *3* (4).
Schrenk, H. von. — (1); — (11); — (12).
Schuchert, C. — (12).
Schwatka, Lt. *13, 42, 57, 95* (4).
Scoville, A. H. — (11).
Scribner, F. L. *175, 733* (12a); *176* (22); *175, 176* (22a).
Seely, C. B. *2* (4b).
Sellon, G. I. *42* (14).
Setchell, W. A. — (4).
Setchell, W. A., C. B. Setchell, H. E. Parks & S. T. Parks. — (1); — (4).
Sewall, C. S. *161, 356* (1).
Shafer, J. A. *314* (11).
Shainwald, R. L. — (4).
Shantz, H. L. — (14).
Sharp, S. S. *365* (12).
Shaw, W. T. — (4b).
Shear, C. L. *3395, 3716, 4711, 4712, 4923* (12); *3076* (12a); *3853* (19); *4407* (22b).
Sheldon, C. S. *144, 533* (12); *5823* (18).
Sheldon, E. P. *8577, 8577b* (4b); — (24).
Shepherd. — (1).
Sherman, B. *391* (4b).
Sherwood, W. *309, 324* (24).
Shimek, B. — (11).
Shipman. — (11).
Short, C. W. — (11).
Shrader, F. C. — (4a).
Shumway, E. — (1).
Simmons, H. G. *92* (1).
Simms, R. C. & W. H. Zeh. *683* (12).
Singer, F. W. *16* (11).
Slaughter, H. W. *9* (22a).
Small, J. K. — (11).
Smiley, F. J. *121* (12c).
Smith, B. H. —, *15* (12); — (19).
Smith, C. P. *1846, 2216* (8a); *3021* (11); *2291* (12b); *1544, 2341* (16); *1571, 2160* (22a).
Smith, E. C. — (12); — (14); — (19e).
Smith, F. H. *28* (18).
Smith, G. — (12).
Smith, H. G. — (14).
Smith, J. D. — (1); — (11).
Somes, M. P. *3023* (11).
Sones, G. D. — (11).
Sonne, C. F. —, *442* (12c).
Sornborger, J. D. —, *51* (1).
Soth, M. E. *P-7* (22a).

Soule, A. — (4a).
Spalding, M. — (4b); *4998* (11); — (24).
Sperry, O. E. — (20a).
Spiegelberg, C. H. *526* (4); *524, 525* (4b); —, *527* (24).
Spillman, W. J. *131* (6a); *360* (11).
Sprague, R. *702* (4); *700, 701, 703, 704, 705, 706, 708* (4b); —, *706, 707* (24).
Standley, P. C. *4020, 4307, 4388, 4709, 4786, 6524, 7665, 13476, 14109, 14130* (5); *11268* (11); *4023, 4135* (14d); *4269, 4784, 14329* (19b); *6151* (20).
Standley, P. C. & H. C. Bollman. *10699* (5).
Stansbury, J. — (16).
Stanton, F. J. *72* (6a).
Stapleton, E. *53* (22a); *53* (22b).
Starz, E. — (12a); — (22).
Stecker, A. *330* (1).
Steinbeck, W. P. — (12c).
Stejneger, L. *48* (1).
Stephens, K. *1* (1).
Stephenson, B. C. — (11).
Steward, A. N. *366, 480* (22a); *36* (24).
Stewart, F. C. *293* (11).
Stewart, R. — (12).
Steyermark, J. A. *994* (1); *329, 550, 551* (11).
Stillinger, C. R. *10, 12* (4b).
St. John, H. —, *90691* (1); *9087* (4); *4788, 7855* (4b); *3038, 6065* (24).
St. John, H., W. W. Eggleston, R. Beals & F. A. Warren. *9450, 9458* (4b); *9387* (22b).
St. John, H., V. Gessell, G. N. Jones, L. Ridout & E. W. Woods. *4240, 4269* (24).
St. John, H. & R. Palmer. *9563* (4b).
St. John, H. & F. L. Pickett. *6508* (24).
St. John, H., F. L. Pickett & F. A. Warren. *6879, 6880* (24).
St. John, H., J. A. Cary, F. L. Pickett & F. A. Warren. *3459* (22b); *6325* (24).
St. John, H. & L. Ridout. *3643* (4b).
St. John, H. & C. P. Smith. *8333* (4b).
St. John, O. *22* (5); *6* (12).
Stokes, S. G. — (16).
Stone, F. M. *511* (5); *204* (8a); *204* (8c); *568* (12); *598* (14); *607* (14d).
Stone, H. E. — (11).
Stone, W. — (4).
Stoney, G. U. — (4).
Streator, *6* (4b).
Streeter, M. *1449* (22a).
Sturgis, R. — (1).
Sturgis, W. C. — (5); — (14); — (14d).
Sudworth, G. B. — (11).
Suksdorf, A. — (24).
Suksdorf, W. N. —, *8801* (4); —, *6090* (4b); — (11); — (22b); —, *8560, 8570, 8615* (24).
Swarth, G. S. *180* (4).
Swarth, W. W. *24, 105* (4).
Swingle, D. B. — (12); — (12a); — (18).

Tarleton, J. B. *77* (4); *3* (4b).
Taylor, M. — (14a).
Thomas, C. — (12).
Thompson, H. — (11).
Thompson, J. W. *12441* (2); *7158* (4); *3456, 3566, 4804, 5077, 5461, 6436, 7225, 7278, 9193, 9581, 10441, 11735* (4b); *11433* (6); *2425, 2430* (6a); *6027, 6207, 6211, 6345, 8220, 10441, 11422* (13); *5981, 11461* (22a); *5946, 5996, 6004, 6502, 8227, 10485, 11329* (24).
Thornber, J. J. *2843, 2862, 2876, 8925* (5).
Thornber, J. J. & F. Shreve. *7931, 7951* (5).
Thornton, C. W. *411* (1); *27, 136* (3).
Tidestrom, I. *343, 1482* (8a); *1676, 3740* (12); *3426* (15).
Toumey, J. W. — *352* (5).
Townsend, C. W. — (1).
Trask, F. — (22a).
Trelease, W. *4806, 4807, 4807a, 4808* (1); —, *460* (11); — (12); — (14a); *4805* (22a).
True, F. W. & D. W. Prentiss. *60* (1).
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